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ABSTRACT

Building upon Course I, this teaching guide for the first of four units of Course II introduces the secondary student to geographic concepts and generalizations of the physical world to which man has related over time. All units of the second course emphasize the process of development whereby man, coping with given conditions in his physical environment, develops established ways of dealing with the problems of socialization, economic constraints, and political power. "Man and His Physical Environment," a seven week instructional unit, provides a framework for study of the emergence and development of simpler and advanced cultures. Students arrive at concepts utilizing inductive methods while studying landforms, climate, vegetation, soils, and location globally in relation to the distribution of man. A student manual is incorporated into the guide. Transparent-overlays and other visual aids are listed including slides, maps, and selected films developed to teach concepts basic to an understanding of man's physical environment. Related documents are ED 048 062, SO 003 169, through SO 003 175, SO 003 516, and SC 003 517. (Author/SJM)

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MAN AND HIS PHYSICAL ENVIRONMENT

TEACHER'S MANUAL

1967

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TEACHER'S MANUAL

Evans R. Mank

Prepared by the Social Science Curriculum Study Center,
University of Illinois Curriculum Laboratory,
1212 West Springfield Avenue,
Urbana, Illinois

1967

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PREFACE

The Social Science Curriculum Study Center at University High School, University of Illinois, Urbana, has as its objective the development of the first three courses in a sequential junior-senior high school social studies program. These three basic courses for the secondary school social studies are a part of a five-year sequence designed to contribute to a program of study that introduces the student to: (1) the structure of man's social order and how this social order relates to the individual in his own and other cultures; (2) the dynamic nature of cultures and the role of the individual in relation to cultural change; (3) cultural diversity.

The development of the three sequential social studies courses begins, first, with the identification and selection of concepts and generalizations essential to understanding man's relationships to his social, economic, and political institutions at different periods in time in our own culture and in other selected western and non-western cultures. In developing the new course materials, priority is given in achieving maximum involvement of the student to the end that he arrives INDUCTIVELY at the concepts and generalizations and develops skill in analysis. Students are introduced to the methodology of the social scientists and historians as they conduct their own investigation of the societies studied in the new course materials.

Instructional materials appropriate to teaching the concepts, generalizations, and skills in social analysis, are selected using the best of existing materials and developing new materials to achieve the objectives of the new social studies program. Evaluation materials are developed concurrently with the new instructional materials to measure the degree to which content, materials, and procedures achieve the predetermined objectives.

The procedure followed in the development of each of the three courses involves these five stages:

1. Identification of concepts, generalizations, and skills of social analysis by the project staff in cooperation with academic specialists in art, cultural anthropology, economics, geography, history, political science, regional area studies, sociology, psychology, and teacher education.

2. Preparation of the new course materials and evaluation instruments which are then tried out in the University of Illinois High School.

3. Revision of the new course and evaluation materials and preparation of a Teacher's Manual with tryout in a small number of selected pilot schools whose teachers have benefit of consultant help by the project staff including orientation to the new materials in summer institutes.

4. Second revision of the new course materials and evaluation instruments and tryout in a larger number of cooperating public schools with continued teaching at the University of Illinois High School.

5. Further analysis of selected data from trial in the University of Illinois High School, pilot and cooperating schools, and publication of the new course materials.

Building on the concepts and generalizations introduced in the units of the First Course--The Family in Society, Unit I; Man's Economic Institutions, Unit II; and The Political Unit, Unit III--the emphasis in the Second Course is on those historical developments that affected all mankind. Selected simple cultures, as well as advanced regional cultures in Eurasia and the New World are studied. In all instances the emphasis is on the PROCESS OF DEVELOPMENT whereby man, coping with given conditions in his physical environment, develops established ways of dealing with the persistent problems of socialization, economic constraint, and political power. The second semester or one-half time in the Second Course deals with Western Civilization, the advanced culture that emerged in the western portion of the Eurasia landmass. The focus, again, is on concepts and understandings that were introduced in the First Course.

This Teacher's Manual, MAN AND HIS PHYSICAL ENVIRONMENT, is Unit I of the Second Course. The concepts and generalizations introduced here are drawn from geography, in the main, and introduce the student to the physical world to which man over time has had to relate in his sojourn on this planet. Study of the emergence and development of simple or advanced cultures must, of necessity, be viewed in the larger framework of man's physical world.

Landforms, climate, vegetation, soils, and location are studied globally in relation to the distribution of man. A series of transparent-overlays has been designed and developed to teach the concepts basic to an understanding of man's physical environment. These transparent overlays and other visual aids including slides, maps, selected films have been developed and/or selected from the best of existing materials to facilitate the teaching of basic geographical concepts and generalizations inductively when feasible and appropriate.

The materials in this Teacher's Manual, MAN AND HIS PHYSICAL ENVIRONMENT, and in the Student's Manual have been developed by the Staff at the Social Science Curriculum Study Center, University High School, University of Illinois, Urbana, in cooperation with Project Social Studies, U S. Office of Education, Department of Health, Education and Welfare. Evans Mank, geographer on the SSCSC Project Staff, has had major responsibility for the development of the instructional materials in Unit I of the Second Course. He and members of the Project Staff have had the benefit of consultant help of members of the Department of Geography, University of Illinois, and, in particular, of Professors Joseph A. Russell and Alfred W. Booth, who have given generously of their time to working with the project staff in the development of these trial teaching materials which were taught for the first time in the fall of 1965 in a small number of public schools in Illinois.

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Johnson, Acting Director

June 1967

Ella C. Leppert, Director
Social Science Curriculum Study Center
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317-333-1000
333-8203

UNIT OUTLINE

I. SURFACE OF THE EARTH. (2 1/2 days)

The world in which man lives is different from place to place with no two places being exactly alike.

A. Each specific place is usually made up of a mix of elements which may be classified under two major headings.

1. Human elements
    - a. Man
    - b. Man's works
2. Physical elements

B. Differences in the earth's surface occur because the above elements are unevenly distributed over the surface of the earth.

II. MAPS. (3 days)

The map is the most suitable means of illustrating the manner in which elements are distributed over the surface of the earth.

A. The function of a map is to reduce a large area of the earth's surface to a size that can be easily utilized for close analysis.

B. Making a flat map from a round globe results in certain imperfections in the finished map.

C. A finished map is a combination of point symbols, line symbols and area symbols.

III. POPULATION. (7 days)

The human element (man) is unevenly distributed over the surface of the earth. Two very important trends are taking place in the realm of human population that contribute to this uneven distribution:

A. An increasing number of people are inhabiting the earth.

B. Throughout the earth population is moving from the rural to the urban areas.

IV. FIELD STUDY

V. LANDFORMS (5-6 days)

The landforms of the earth are different from place to place.

VI. CLIMATES (8 days)

Climates vary from place to place over the surface of the earth but the pattern of distribution of major climatic types is very orderly.

VII. VEGETATION (4 days)

Natural vegetation differs from place to place over the earth's surface but broad regions of similar types may be distinguished and these regions correspond closely to climatic conditions.

VIII. SOIL (5-6 days)

The soils of the earth are different from place to place but large regions of similar types may be discerned. These regions are closely related to the other elements of the physical environment--climate, vegetation and landform.

GEOGRAPHY UNIT

TEACHER'S REFERENCE

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The Social Studies and the Social Sciences. Sponsored by the America Council of Learned Societies and the National Council for the Social Studies. New York, Harcourt, Brace and World, Inc., 1962.

Strahler, Arthur N. Physical Geography. New York, John Wiley & Sons, Inc., 1963.

Van Riper, Joseph E. Man's Physical World. New York, McGraw-Hill, 1962.

Walker, Ernest D. Understanding Soils, by E. D. Walker and W. F. Purnell. University of Illinois, College of Agriculture, Cooperative Extension Service. 1964.

MAPS

Quadrangle topographic maps are essential for use with the Field Study and Landforms section of this unit. An index to topographic maps of Illinois has been sent to cooperating schools. The index, as well as the topographic maps may be procured from: Illinois State Geological Survey, Natural Resources Bldg., Urbana, Illinois.

FILMS

All films available from: Visual Aids Service, University of Illinois, Champaign, Illinois, 61822. Phones: Area Code 217, Booking--333-1360 and 1361.

LISTING OF COPYRIGHTED MATERIALS USED IN THE TEACHING OF THIS TEXT

Appearing below and on the following pages is a listing of all materials used in this text which have been borrowed from other sources, and which have been omitted from this version of MAN AND HIS PHYSICAL ENVIRONMENT in compliance with copyright law.

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16 [statistics--Total World Population]

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27 [Farmers: The Real Surplus]

Dorner, Peter. "Farmers: The Real Surplus" New York: The Nation, February 9, 1963, Volume 196, No. 6, pp. 115-117+.

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Ward, Barbara. "The City May Be as Lethal as the Bomb" The New York Times Magazine, April 19, 1964, p. 22f.

31-36 [Megalopolis: A Very Special Region]

Twentieth Century Fund Report. The Challenge of Megalopolis, (New York: The Macmillan Company, 1964), pp. 5-13.

46 [Physical Landforms]

Van Riper, Joseph E. "Physical Landforms" Man's Physical World (New York: McGraw-Hill, Inc., 1962), an excerpt.

58 [Climate in Everyday Life]

Brooks, C. E. P. Climate in Everyday Life (Edinburgh: J. & J. Gray, 1951).

76-81 [MAPS--see pages 76-81 for more complete detail. The two sources of these maps are listed below.]

Van Riper, Joseph E. Man's Physical World (New York: McGraw-Hill Book Company, 1962).

Finch, et al. Elements of Geography 4th Ed. (New York: McGraw-Hill Book Company, 1957).

COURSE II

UNIT -- MAN AND HIS PHYSICAL ENVIRONMENT

SURFACE OF THE EARTH

The world in which man lives is different from place to place with no two places being exactly alike.

The idea of the earth surface being different from place to place is not only the starting point but the central understanding for this unit. Most young people realize that there is variety on the earth surface, but too few are really conscious of the nature of this variety. This section is planned to prompt students to be more observant of the visual landscape in its entirety, and to help them see what elements account for the actual differences, both cultural and natural, that occur from place to place. Some earthly differences are completely obvious and easily identified but others are much more subtle and require close examination. Examples of both will be brought out.

1. Begin by showing the students 7 different slides (numbers 209-215) the first two of which illustrate the farm on which Jim Jones lives. Allow the students several minutes to view each slide before proceeding to the next. The students should be cautioned to examine each slide in detail making brief notes on what they see. The case of the young adult who has lived his life to date in the same community is used because, to him, most places visited would present something new and different. Nothing would be taken for granted as might be the case with a more representative teenager who has traveled widely in the United States and, possibly, abroad. 1

2. Many responses will be brought out here and this is desirable, e.g.; 2

   a. The earth is a place of great variety,

   b. These places sure are different from the Illinois farmland,

   c. Each place is obviously different from the other. (Emphasize this answer because it is the desired one!)

   d. Each of the pictures of places that Jim visited seem to represent extreme differences in places on the earth surface.

3. Here we are interested in students observing the nature of earthly differences. The key words or phrases to look for are included in the following statements. Write the statements on the board and underline 2

the key words as they are given. Make sure the students take down the class statements in their manuals using the reverse side of the page.

a. There is a difference in land features from one place to another (flat land, hills, mountains).

b. Water was present in some places and not in others.

c. The number of people varied from none to many.

d. Some places showed the works of man whereas others were void of features.

e. Vegetation varied in kind and amount.

f. Climate was evidently different from place to place.

g. Man's occupations were different from place to place.

3 4. Show slides 216 and 217 to the students Jim would probably think that these places look very similar to his farm home in Illinois, especially the flat land. The point to be arrived at is that many places throughout the world are much alike in some respects. The differences we see here are much finer than the differences that were pointed out in the first set of slides where differences were very obvious.

3 5. Here the teacher poses a question to the students:

You have noted that the last two slides that were viewed looked very similar to Jim's farm home in Illinois. One cannot easily pick out ways in which these places differ from each other. Nevertheless, differences can be found. In each place the major crop is soybeans. The yield of soybeans per acre is:

Jim's farm -- 35 bushels/acre.
Slide (216) -- 27 bushels/acre.
Slide (217) -- 18 bushels/acre.

How do you account for this very real difference (acreage yield) from place to place? Write the answer in the question 5 space in the manual. Remind students to write discussion notes on the reverse of question 5. Possible answers include:

a. The soil may be different.

b. Precipitation may vary, thus a difference in climate may exist.

c. Man's techniques may be better in one place than in another.

d. Fertilizer could be a factor.

6. Have the students refer to their answers and the class discussion notes from question 3 and 5. Look particularly at the underlined words (land features, people, soil, etc.): 3

a. The desired categorization is:
Natural or Physical elements,
Man Made elements,
Man himself.

Other possibilities are:

b. Cultural elements and natural elements.

c. City, farm and wilderness.

7. Using the desired categorization above, have the students group the elements into these 3 categories (labeled) during class discussion. 4

Label (Natural or Physical)

Elements
Soil
Vegetation
Climate
Water (Minerals)
Landform
Wildlife

Criterion
all are natural elements that exist independent of man.

Man Made

Buildings
Farm equipment
Fertilizers

All are made by man working with element of his physical environment

Man

Man

Man is in a category by himself. Center of his environment

While on the subject of physical or natural elements, ask the students if there are any other physical elements that they can think of which should be included in this larger category (minerals and animal wildlife). There is no need in extending the list of Man Made elements because this will not be our concern in this unit.

5 8. Given the data presented in sections 1 through 7, students are asked to prepare a series of statements that suggest generalizations that they begin to arrive at from a study of the data. Examples follow:

   a. The earth upon which man lives is different from place to place.
   b. Some earthly differences are quite evident while others require some investigation to discern the differences.
   c. All the elements of the earth can be broadly categorized as Physical, Man Made or Man himself.
   d. Some places throughout the world are very similar in some respects to other places far removed.
   e. The surface of the earth influences the activities of man.
   f. Man in turn, has influenced the surface of the earth.

The teacher should explain to the students at this time that these generalizations get to the heart of this unit of study. The great concern will be with the differences and similarities that prevail over the earths surface.

Try to illustrate this idea by assembling a set of colored pictures (magazines, etc.) or have the students bring in pictures of very different and similar places that are far removed from each other. (Example: Kalihari and American deserts.) Also, try to get pictures that emphasize the relationship between man and the land.

MAPS

The map is the most suitable means that we have at the present time of illustrating the manner in which elements are distributed over the surface of the earth.

A very short lesson is inserted here to familiarize the students with maps--their purpose, construction and component parts.

7 2. The purpose of a microscope is to enlarge a very small area in order to see it more clearly and completely. With a map the opposite is true. Here you are working with an area of the earth usually too large to be seen by the human eye. The area must be reduced so that it can be seen in its entirety. A map is an instrument for doing this. (Don't push the students too far on this. Their concept of a map should be enlarged considerably after discussing the following points.)

3. Emphasize that the scale of the map does provide (a) A device to determine distance on the map, (b) More importantly a means of determining how much reduction has taken place from the real earth surface to the globe. 7

4. Use Transparency (Tr-111) for this lesson. 7

   a. The scale of a map the actual size of the globe is 1 to 1. (The unit of measurement may be any that is desired.) You may keep in mind that there are 63,360 inches in a mile.

   b. Show the overlay of the City of Freshville to see if the students can relate back to question 3. The scale of 1 inch to 1/4 mile should be not only a measuring device but also indicate how much reduction has taken place from the real earth to this small map. Indicate this by means of a fractional scale $\frac{1}{15,840}$.

   c. Show the overlay of Corny County. The same routine as in (a.) applies here but with changes in the scale. This is a smaller scaled map than the one of Freshville and this can be shown to the students by referring to the fractional scale $\frac{1}{316,800}$, an obviously smaller fraction.

   Points of interest are more general in detail on the map of Corny County because one inch of map space now represents much more earth surface. Conclusion: The smaller the scale, the less the detail.

   d. The State of Happiness has the smallest scale hence the greatest amount of reduction. $\frac{1}{823,680}$. It could scarcely be seen on a world map of 1 inch to 750 miles.

5. Some features on the map are deformed when making a flat map from a round globe. Some of the things that can happen are the following: 8

   a. The shapes of land masses may be changed.

   b. The areas of land masses may be changed.

   c. The distance between two points may be changed.

   d. The direction may no longer be correct.

6. a. Lines of latitude are equidistant and parallel. Frequently they are referred to as "parallels." 8

   b. Lines of longitude converge at the poles and each are the same length.

   c. Have the students locate 2-3 points on one of their maps and then check their findings. Do they all know how to use the grid for location purposes?

9 7. Use Transparency (Tr-112) to show how three basic types of projections are made. Start with the three globes, over which you place three types of paper surface. A light is placed in each globe and the shadow of the globe's grid is cast on each of the paper surfaces. Have the students analyze what has happened to the lines of latitude and longitude in each case.

a. Conical projection. The lines of latitude are no longer equidistant. They set further apart as the pole is approached in this projection. (The actual distance between each degree of latitude is approximately 69 miles.) Also the lines of longitude appear as if they will never come together again.

b. Azimuthal (Plane) projection. Again the lines of latitude are no longer equidistant and lines of longitude get increasingly further apart.

c. Cylindrical projection. The lines of latitude become increasingly further apart and some of them can not be shown on this projection. Longitude lines do not converge at the poles. (This is the Mercator projection and you may want to show the students this map and the exaggeration that has occurred to Greenland which is actually about 1/8 the size of South America.

d. The point of least distortion in each case is where the paper surface touches the globe. A land mass situated here would be little affected by the transformation.

The teacher may clarify the projections to the students with the use of a ball or orange and a piece of paper.

Note to teacher:

All students should bring to the next class meeting material with which to work on Question 3 - POPULATION. (Graph paper, straight edge, pencil, ballpoint, and colored pencils.)

9 8. Use Transparency (Tr-113) with this lesson. The students should come to realize that a map is an illustration that is portrayed through some combination of point symbols, line symbols and area symbols.

a. LINE SYMBOL. Used to portray the map grid (lines of latitude and longitude) which provide direction and enable places to be located.

b. LINE SYMBOL. Used to enclose and portray a specific area, in this case a political area.

c. LINE AND AREA SYMBOLS. Used to portray a natural feature occurring in this particular area--rivers and also the areal extent of lakes.

d. LINE SYMBOLS. Used to portray cultural (man made) features occurring in this particular area--railroads and highways.

e. POINT SYMBOLS. Squares, triangles and circles used to locate a particular element. The meaning of the point symbols will be made clear on another part of the map.

f. AREA SYMBOL. Used to portray the areal extent or distribution of a particular element--all land that exceeds 1000 feet in elevation.

9. Additions that must be included: 10

a. LEGEND. Used to explain the different map symbols.

b. SOURCE. Relate the source of important data included on the map.

c. LETTERING. Identify the specific items on the map.

d. SCALE. Used to determine distance on the map and how much reduction from the actual earth has taken place.

2& 3. Graph making is an important skill that can be taught here. The basic 11
parts of a graph are found on the illustration in number three. Insist on all graphs being accurate and complete. Students should be concerned about three things when plotting the vertical (population) axis:

a. Use up as many of the divisions on the vertical axis as is possible

b. Try to have your division assigned reasonably rounded numbers.

c. Do not change the value of the divisions from bottom to top.

4. It would be helpful for the teacher to construct his own graph using the 12
base grid on Transparency 114.1 for class discussion of questions 4 and 5.

6. The percentage (rate) of change in world population from 1900 to 1950 12
was $1610\overline{)790} = 49\%$. Compare this to the state and local figures if you have them.

7. The short reading, "Changes in Number of People," by John W. 12
Alexander, is used to check reasons given by the students in their response to question 5. The matter of birth rates, death rates and resulting difference is extremely important and should be considered by the class. These statistics for selected countries plus the annual rate of increase for world areas is included in the student manual for use at the teacher's discretion. Perhaps some interested students would care to take a world map and color it using a different color for different ranges of population change.

8. This large and growing number of people is creating pressure on the 12
resources of the earth. This involves both natural resources, including food, and man-made resources. Here we focus on food.

9. Assign the reading "Food and the World" by Karl Sax. There are many 13
interesting ideas in this reading about feeding the world's people. Perhaps you may want to ask key questions that the students would consider and answer as they read. Transparency 28 can also be helpful in class discussion. Comparing this transparency with the statistics on population growth on page 16 would be very interesting. Look for novel ways to use this reading.

10. Follow the same rules in graph making as in number 2. Only one sheet 13
of graph paper is needed for both lines. As for the teacher, you may use Transparency 45.1 and ignore the Illinois situation or else plot the data on Tr. 114.1 and use it for class analysis.

14 13. Have the students read "Farmers: The Real Surplus" to verify their reasons to number 12. You may only want to take the figures in the last paragraph of this reading and consider the results of technology on the farmer. A secondary reason for urbanization is the attraction of the cities. The poem Chicago by Carl Sandburg will emphasize this point.

14 15. This is a very provocative, hard hitting article that should arouse some discussion. You may want to consider ideas such as the "homogeneous suburbs," "safety valve" and "plight of the cities."

15 16. Look for good concluding statements here: Urban areas are growing at the expense of the rural and together with the absolute growth in the number of people, the population is becoming more unevenly distributed with each passing year.

15 17. Other trends taking place are:

a. The absolute decline in population in the large central cities. (New York being one.) Movements of people to the suburbs.

b. The growing together of urban areas to form the Megalopolis of the world.

15 18. The reading "Megalopolis: A Very Special Region" can be used as the teacher wishes at this point. This is a relatively new development in human population and one that should be considered seriously. The Megalopolis of northeastern North America is but one in the world. They can also be found in Japan and Europe. Another one is developing from Milwaukee to Detroit in the United States.

15 19. Now consider the world population. Using Transparency (Tr. 117) 1960 World Population Distribution, locate areas of dense population. It may be a very good exercise in name and place location to have the students point out and identify the places on the map. The students have a world map of their own with an outline of areas of dense population. Have the students shade-in (dark red) the areas as they are identified in class. A box of No. 019-12 colored pencils is essential. It is important, however, that you do not spend too much class time for this type of work. Have them begin the task in class and complete it for homework. This is the first in a series of 6 maps which the students will develop. It is of great importance that they take care of their maps and shade in as neatly and accurately as possible. These maps will be used continuously throughout Course II and III. The teacher should grade these maps and use them during examinations.

15 20. Do the same for areas of sparse population. Have the students locate the void areas in class by means of a pointer.

FIELD PROBLEM

An activity that should be very worthwhile in this unit is a field study. Have the students select a small area of earth surface that is as free as possible from cultural influences. This will be the student's area of analysis. The study can be broken down into sections just as the classroom work has been divided. In other words, when the topic of classroom discussion is landforms, then the students should be considering the landform and drainage in their area.

The location of the site of the students area should be as accurate as possible. Have students find their location on the grid (latitude and longitude) and their township and section from the quadrangle topographic map. Transparencies 70a and 70b should be helpful when working with the students. The teacher may gain background on the U. S. Land Survey system by reviewing this section in either Strahler or Finch, et al. Quadrangle maps may be obtained from the Illinois Geological Survey, Natural Resource Building, Urbana, Illinois. An index for ordering the required quadrangle map of your area is included with this manual.

Landform can be illustrated very well with a model constructed of clay or a mixture of flour and salt.

For climate, the student will have to find out the location of the nearest weather observation facility and use this data. Prof. John Page has written a book on the Climates of Illinois and this book includes weather information from all the operating weather stations in the state. Local libraries, radio and TV stations should be helpful in locating information on the local climate.

The vegetation section should include a map of the distribution of different types of vegetation. Perhaps the biology teacher can help identify certain species of vegetation, if the geography teacher is at a loss.

The soil section could be quite difficult and the student is probably very limited in what he can do in this respect. Search for different ways to tell about the soil.

One of the major efforts in geography is to seek out the relationships that exist between phenomena that prevail on the earth surface. Encourage the students to look for these.

Conclude the study with a statement on land use and the prospects for the area in the coming years.

This study can be conducted either individually or by teams of two. It may be well to have the students themselves evaluate their fellow classmates papers by actually having a checking individual or team go to another site and evaluate their work. Thus everyone would be doing their own project and also evaluating someone elses work as to completeness, accuracy and neatness. It certainly would not be possible for the teacher to visit each site, although spot checks may be very helpful.

This project should consume very little class time. Three to four ten-minute periods should be the limit spent raising questions and checking progress.

The landforms of the earth are different from place to place.

Note to teacher:

a. A good reference for the teacher is Man's Physical World by Van Riper, Chapter IV.

b. Have each student purchase a 25¢ box of colored pencils and keep them sharpened (# 019-12 is desirable).

1. The topic of discussion now turns to the physical environment of man. 39

2. Landforms refer to surface features of the land and not the many different shapes that land can take in its outline form, such as peninsula, isthmus or island. Answers may include: 39

    - mountains
    - valleys
    - plateau
    - mesa
    - butte
    - plains
    - hills
    - moraine
    - ridges
    - basins
    - caves

3. Mountains, hills and plains. This is probably the simplest and most adequate breakdown for our purpose. 39

4. We are looking for student definition of: 39

    a. Mountains.

    b. Plains.

    c. Hills.

    Let the students bring out all thoughts that they have in regards to these three land form types.

5. Van Riper's definitions of certain landforms will clarify some matters but also create some problems especially with "local relief". It is important that this idea is understood because it becomes the key criterion in the determination of landform areas. 39

    c. 1. Hills (Local relief--1,300 feet)
       2. Plains (Common local relief--150 feet)

7. Be sure to experiment with the stereoscope and stereograms before class to become accustomed with these devices. On Stereogram 126 you will probably have best results if the stereoscope is expanded widely--70 mm. or more. Individuals do differ in the distance between their eyes so you may have to adjust the stereoscope. To locate points on the 40

stereogram start at the lower left hand corner of the photo. Read the horizontal axis first (ex. A. 5 or D. 2) and then the vertical axis (ex. 1. 7 or 3. 3). Where the extension of these locations intersect, your point will be found.

Several keys can be found on the stereogram, but it is probably best to cover up all identification on the photo while students are analyzing them.

H = Altitude of the plane above the earth surface.

RF = Representative Fraction. This is one way of stating the scale of the photo. (Ex. 1:15,840----1 unit on the photo is equal to 15, 840 units on the earth surface) It is probably easiest to think in terms of inches (63, 360 in. = 1 mile). Thus, in the RF of 1:15, 840, one inch of the map is equal to 1/4 mile of earth surface.

41 8. See the annotation for description of this area. It is probably best for the teacher to locate the points and mark them on the photo by means of a small (x) with a grease pencil. You need to do this on only one side of the stereogram.

41 9. This is a good opportunity for the students to get familiar with the U S. G. S. topographic maps. They will need a similar type map when analyzing their own area for such factors as location and landform characteristics. Study the brown contour lines carefully. The interval between contours is stated at the bottom of the map and this can vary between maps. A darker contour line can be found for every fifth interval and you will find this a great aid for height finding purposes. The points from the photograph have been located on the topographic map with a small (x). The relief difference is approximately (A) 10, 500—(B) 6, 632 = 3, 878 feet. This amount of relief clearly indicates mountainous areas. Allow the students to work individually or perhaps in pairs on this problem. You may have to devise a scheme to convey the meaning of a "contour line". A relief model is the best if you have one.

41 10. The landforms outline map in the manual is a duplicate of the transparency provided for the teacher. When a particular element, for example mountains, is being discussed and shown on the screen, have the students code the appropriate areas with the appropriate colored pencil and then complete the shading for homework. DO NOT take more than a few minutes of classroom time for them to get started. Caution the students to be neat in their work. These maps will be used for references on many occasions and the teacher should structure some tests around them. (A small box of colored pencils will be needed by each student.)

11. Use Transparency (Tr-118). First look at the distribution of mountainous areas throughout the earth. Using Van Riper's definition of mountains as criteria and brown shading as the symbol we can locate the mountainous areas of the world. Geographers like to refer to these areas as regions, e.g., "mountain regions." The word "region" has been used traditionally in geography as meaning an uninterrupted area possessing some kind of homogeniety in its core, but lacking clearly defined limits. 42

a. Examples of general observations:

Africa and Australia have very few mountainous areas.
Asia has the biggest area of mountains of any continent.
The west coast of the Americas is a continuous range of mountains.
There appears to be a "ring of mountains" completely encircling the Pacific Ocean.

b. Himalayas (Asia
Rocky Mountains (N. America)
Andes (S. America)
Pyrenees (between France and Spain)
Caucasus (between Black and Caspian Seas)
Alps (Europe)
Appalachian (Eastern N. America)
Atlas (N. Africa)

c. See Finch, et al. for a description of the Pamir Knot.

12. Here we want to see the relationship between mountainous areas and dense population. Comparatively little overlap is found but several important exceptions are noted: Japan, European Alps, S. W. China, N. W. Pakistan, Caucasus Mts. 42

13. Again locate the points with a grease pencil on Stereogram 132 before the students begin. The annotations on Stereogram 132 can be very helpful to you. Note the meanders, oxbow lakes (severed meanders), meander scars where the river was once located. 42

14. On the Crowder Quadrangle the photograph points can be found in sections 28 and 32 on the township R1E and T26N. Only 15-20 feet of relief is in this area. (Note the 135 foot contour near the river) This is a plains area associated with a stream. (Alluvial plains.) 43

15. There are no points located here because of the changing nature of deltas. Note how the main channels split into distributaries. Also the frost polygons on the land of higher relief that result from annual freezing and thawing in this area. 43

43 16. There is probably 20-30 feet of relief in the delta area. You'll note a 50 foot contour line about 10 miles upstream from the delta mouth. This is a small delta plain forming a part of a larger, marshy coastal plain.

43 17. Using Tr. 118 show the distribution of plains throughout the world. See if the students, in class, can define the particular type of plains. In any case, make sure they all know the correct definition before going on. (See Van Riper, pp. 102-111). Have them do some color coding and shading as you go along.

COASTAL PLAIN - The shelving edges of continents.

Guinea Coast and West Africa
Eastern Brazil and Guianas
North European Coastal Plain
Maine and Texas in U. S. A.
Southern Australia
Central America
Most of land fordering Arctic Ocean in Asia and North America.

INTERIOR PLAINS - Broad plains usually found in the interior of continents.

Mississippi River Drainage Basin
Congo Basin
Canadian Plains
Central Australia
Northern Europe, widening greatly in Western Russia.
Amazon Basin and Pampas in South America.

ALLUVIAL PLAIN - Stream deposited sediment along course of stream.

DELTA PLAINS - Stream deposited sediment at mouth of stream.

Mississippi River
Colorado River Delta
Central Valley - California
Indus Plains - West Pakistan
Ganges Plain - India
Irrawaddy Delta
Nile River Plains and Delta
Po Valley - Italy
Rhine Delta - Netherlands
Hungarian Plains
Nile Delta
Yangtze and Yellow Rivers - China

HIGH PLAINS - Plains which lie at elevation over 2,000 feet.

Tibet
Mexico
Western U. S.
Western Canada
Bolivia (Altiplano)
Iran
Spain

44 18. We're now looking at the relationship between people and plains. A considerable amount of overlap is found. You may ask which type of plains are most densely populated (Delta, Alluvial and Coastal). Have the class identify the heavily populated plains areas. Check to see if they are taking care of their outline maps.

44 19. Locate the points on Stereogram 135 at the observation tower and the bend in the drainage pattern.

20. Find Pickering Knob in the lower left hand corner of the Holden Quadrangle. There is approximately 1933-1360 = 573 feet of relief. Maximum relief in the larger area is probably near 1000 feet. Variation is great but certainly this is a hills area. 44

21. Show the distribution of hills throughout the world. Some of the more important hills areas to look for are the following: 45

- Scandinavian shield
- Brazilian uplands
- Most of Siberia
- Most of England
- Inland from Guinea Coast--Africa
- Australis (East and West)
- Much of Southern Africa
- Laurentian Shield (Eastern Canada)
- Ethiopian shield
- Indian (Deccan Plateau)
- South and Western China
- Central Mexico
- Chile
- Appalachia (U. S.)
- Pre-Alps of Europe

22. Examine the relationship between hills and dense population. A significant amount of overlap can be found. Ask the students to identify the heavily populated hills regions. 45

23. The relationship between landforms and man's use of this land is an interesting one. Use the four stereograms 126, 132, 187 and 135 together with 303, 109 and 182 to consider the man-land relationship. In one case (126) the nature of the land serves as a formidable barrier to much use by man, except perhaps recreational. On stereogram 109 and 182 we see how man in our society overcomes some of the terrain problems to use the land. In 303 we see how the Japanese overcome almost all of the landform problems in this area to make use of the land for intensive rice farming. (Note how the drainage systems are even used.) On 132 we see much land, almost void of relief, used only for trees. Does this say anything about population pressures? 45

CLIMATES

Climates vary from place to place over the surface of the earth but the pattern of distribution of major climatic types is very orderly.

Note to teacher: Physical Geography by Strahler (Chapters 7-15) and Elements of Geography by Finch and Trewartha (Chapters 2-10) are excellent references for this material.

1. Climate is the next element to be studied. 47

2. You will probably get such answers as: 47
   a. Average temperature or rainfall of an area.
   b. Atmospheric conditions over a period of time.
   c. More than average conditions--it is the range of conditions over a spread of time.

3. Answers will probably include some of the following: 47
   a. Weather is what you get every day.
   b. Climate takes up longer time periods and larger areas.
   c. Weather is what the TV weatherman talks about every day.

4. There will be a number of answers but be certain the students have temperature, precipitation, winds and air pressure. Have them underline the major elements. 47

5. Invite class discussion and responses to this question. Have them include the important points in their manual. 47

6. The meaning of weather and climate are developed in the reading. Note that climate is the aggregate or composite of weather conditions over a long period of time. It is not just "average weather" because variation from the average (mean) may be just as important as the average itself. Example: Hurricanes that occasionally invade the southeast coast of the United States may be as important in their own right as the all inclusive climate of that area. It's possible to lose important particulars when working with averages. 47

7. Note to teacher: It is difficult to tell teachers how far to go on this next part. The writer believes that a little exposure is better than none at all. All the following information is from Chapters 2-5 in Elements of Geography by Finch, et al. The purpose is to develop briefly, the major climatic elements (temperature, precipitation, pressure and winds) that combine to make up the variety of climates that prevail over the earth surface. The question may arise as to why the elements vary from place to place. The answer rests in what are known as climatic controls. As a control becomes evident it will be marked for the teacher's benefit

to be pointed out to the students. Don't be alarmed if you can't answer all the questions that are asked. Many will be cleared up when the separate climate types are discussed in class and an example is given. This is primarily a reading and discussion assignment. For our purpose, a modified version of the widely accepted Köppen system of climatic classification will be used to study the actual distribution of the various climatic types. In this system two of the elements, temperature and precipitation, are used to define precise boundaries of climatic types. Consider those elements now.

48 TEMPERATURE

This is a very opportune time to borrow the science department's planetarium to demonstrate the factors that make for differences in solar energy received from place to place. Note how much solar energy is received poleward from 66 1/2° N on the day of the winter solstice. Some questions for the students to consider are: What is the length of time solar energy is received at the equator during a 24 hour period? (12 hours each day.) At what latitudes would you expect to find the hottest days during the course of the summer season? (Between 30-40° because you combine long days of 15+ hours with sun's rays that are quite direct.)

49 PRECIPITATION

It is important that the students understand the process of precipitating moisture from the atmosphere; rising air--expansion and cooling--condensation of moisture. Examples from everyday experiences can certainly be a help here. (Human exhalation on a cold day and warm moist air from the family shower condensing on the cooler mirror glass or cold window are two possibilities.) Examples of cooling through expansion are not as readily available as the reverse of heating through compression. Perhaps you can think of some.

Use the weather map that has been sent along to show fronts and associated air masses. You can also probably make use of the local weather man's illustrations on television.

When discussing the three means of lifting air, ask the students for an example of where and when these situations may prevail on the earth.

a. Thermal convection - U. S. midwest in the summer.

b. Orographic lifting - Western Cascades of Washington and Oregon.

c. Frontal lifting - very evident in Illinois in April.

THE EARTH'S CLIMATE TYPES

A very simple way of looking at climates would be to divide the earth into three basic zones; torrid, temperate and frigid. This is not very exact and one value of the Koppen classification is the fact that it is based on numerical values which define the boundaries of the climatic types; e.g., Tropical Rainforest Climate stipulates that the average temperature for the coolest month cannot be under 64.4° F. and no month of the year has less than 2.4 inches of rain.

The most typical examples of a particular climatic type can usually be found in the core or center of the area with the boundaries being more in the nature of transitional areas rather than areas of sharp differences that a line or color change might indicate. There is certainly a range within particular climatic types and it is important that the students understand this so as not to be too rigid in their thinking.

Remind the students to be very neat in the shading of their outline maps and to keep their map current with class discussion. It might also be well to shade in their hypothetical continent and neatly print the correct climatic type onto this map.

The blank places on the transparency map indicate mountain areas. Mountains have many different types of climates depending on the altitude. Altitude therefore becomes a climatic control.

It is absolutely necessary that all students learn the characteristics of each climatic type. This should not all be rote memory. The name of the climate and its location will be a great help in learning the characteristics.

8. Using Transparency (Tr. 119) have the students locate, with your assistance, the distribution of Tropical Rainforest Climates. Much of the precipitation in this climate is convectional in origin but also of importance are weak tropical fronts. The equatorial region is one of lower atmospheric pressure, quite conducive to heavy precipitation. 53

8.1 This climatic type prevails in the following places:

Amazon Basin
N.E. Coast of South America
East Coast of Central America
East and West Coasts of Southeast Asia
East Coast of Madagascar and the Philippines
East Indies, Sumatra, Java, Borneo, Celebes and New Guinea.
Congo Basin
Guinea Coast in Africa
South Ceylon
East Coast of Brazil
West Coast of India

This is a good place for students to add to their knowledge of the globe. Have them study unfamiliar areas as a homework assignment in preparation for a check to be given the following day.

8.2 Typically this climate is located astride the equator extending out to 5-10° on either side. On windward coasts the latitudinal spread may increase to over 20°.

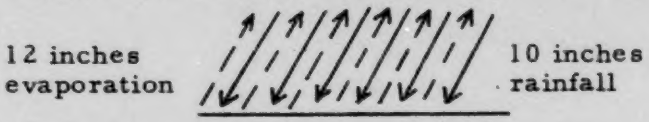
53 9. Show the students the distribution of the Tropical Savanna Climates. This climate occupies a position between the very wet climates on the equatorial side and the very dry climates on the poleward side. During the summer half year the wet climates are most influential and during the winter half year the dry climates are most influential, the reason being that there is a latitudinal movement in climate belts with a latitudinal movement of the sun.

9.1 This climate prevails in:

Central America, esp. west coast.
Yucatan Peninsula
South tip of Florida
Cuba and Hispaniola
Northern South America
Central Brazil
Much of Southern Africa
Area just south of the Sahara
West Malagasy
India
Interior of Southeast Asia
Northern Australia

9.2 Tropical Savanna climate is typically located on the poleward and interior sides of the Tropical Rainforest Climate between 5/10° and 15/20° north and south latitudes.

54 10. Show the students the distribution of the Dry Climates. In this case the steppe and desert are combined into one category. Make clear to the students that the steppe is a transitional climate surrounding the true desert. The following illustration may be helpful in understanding how the dry climates are determined.



In such a case there is a moisture deficit and no ground water supply exists. Evaporation depends on air temperature, thus there is no specific amount of rainfall that can be used to determine the boundaries of the dry climates. Dry climates can be found from the equator to 55° north latitude. The low latitude dry climates that extend from 15°± to 30°± coincide very closely to the large semipermanent high pressure areas with their subsiding and diverging wind systems. The middle latitude dry climates are more the result of location in the interior of continents and away from a source of water. The dry climate in Argentina is an example of a "rain shadow."

10.1 This climate prevails in:

Western United States
Northern Mexico
Patagonia in Argentina
Southwest Africa
Central Asia
Central Australia
Sahara
Coastal Peru and Chile
(Peruvian Atacama)

10.2 Typically the Dry Climate is located between latitudes 15-20° and 30° and toward the interior and western side of continents.

11. Show the students the distribution of the Marine West Coast Climates. 54
The mildness of this climate is brought about by maritime westerly winds. The depth to which this climate penetrates the continent is determined by landform. (Note the difference between Northwest United States and Europe.)

11.1 This climate prevails in:

Southeast tip of Africa
Southeast Australia
New Zealand
Northwest Europe and England
West Coast of North America
South Coast of Chile in South America

11.2 Typically the Marine West Coast Climate is located on the western or windward side of mid-latitude continents, poleward from about 40°.

12. Show the students the distribution of the Humid Subtropical climates. 55

12.1 This climate prevails in:

Southeast United States
Northern India
Southern Japan
East and Southeast Australia
Southeast China
Southeast South America (Argentina and Uruguay)
Southeast Africa

12.2 Typically this climate is located on the eastern side of land masses from latitude 25°± to 40°.

13. Show the students the distribution of the Mediterranean climates. This 55
climatic type is the only one of the earth's humid climates that has a strong winter rainfall regime. The reason for this is explained by the fact that during the summer half year the area is under the influence of the subtropical high on the equatorward side, hence fair weather prevails; whereas in the winter half year frontal activity from the prevailing westerlies on the poleward margins invade the areas. Since the rainfall comes in the winter when the evaporation rate is lower, it is more valuable than if it were a summer rainfall regime.

13.1 This climate prevails in:

The Mediterranean area where it is most extensive and therefore takes its name.
Coastal California South of San Francisco.
Central Chile.
Southwest tip of Africa.
Southwest and Southern Australia.

13.2 Typically this climate is located on the western sides of continents between 30° and 40°.

56 14. Show the students the distribution of the Humid Continental Climates. Continental control is a big factor in this climatic type with the land masses heating up in summer and cooling off in winter promoting a large annual range in temperature. You will note that this climatic type and the sub-arctic that follows is confined to the northern hemisphere because there are no large land masses at this latitude in the southern hemisphere. They are found to the interior and eastern parts of the continents because the maritime westerly winds provide a moderating effect on the west sides of continents at this latitude. Weather changes are rapid and marked in this climatic type because these are the regions where warm tropical air masses and cold polar air masses conflict with each other.

14.1 This climate prevails in:

Central eastern North America
Southern Scandinavia
Eastern Europe and Western Russia, Extending into Central Siberia, Manchuria, Korea, Southeast USSR, Northern Japan and Southern Sakhalin.

14.2 Typically this climate is located in the interior and extends to the eastern margin of northern hemisphere continents. The latitudinal extent is from 35°± to 55-60°.

56 15. Show the students the distribution of the Subarctic Climates. Continental control is operating at its maximum efficiency to bring about the largest annual temperature ranges found anywhere on earth. At Verkhoyansk in the USSR (68°N., 133°E.) the average January temperature is -58° and the average July temperature is 60° for a range of 118°. Long summer days partially offset the weak intensity of sunlight and a growing season of approximately 60 days prevails. Midsummer frosts, however, make agricultural development very unpredictable.

15.1 This climate prevails in:

Northern Canada and Alaska
Northern USSR and Siberia
Northern Scandinavia
Kamchatka Peninsula

15.2 Typically this climate is located in the northern hemisphere between latitudes 55°± to 70°.

57 16. Show the students the distribution of the Polar Climates. An outstanding feature of the polar regions is the long period of constant sunlight and, at the opposite extreme, constant darkness. Winters are extremely cold and even summer temperatures are low because the angle of the sun's rays is very low and ineffective. Precipitation is quite limited but because of a low evaporation rate, snow and ice accumulate to great depths on Greenland and Antarctica bringing about an ice-cap climate. At other places there is some clearing of snow in the warmest months giving these areas a tundra type climate.

16.1 This climate prevails in:

Antarctica Greenland
Northern Iceland
Land bordering the Arctic Ocean in N. America, Scandinavia and USSR.

16.2 Typically this climate is located in the high latitudes, poleward from 65-70°.

17. Allow the students 5 minutes working independently on conclusions and then encourage ideas in open discussion. Some of the desired conclusions follow: 57

a. Climate is different from place to place.

b. There appears to be some order in the arrangement of climatic types over the earth's surface.

c. The effect of the sun appears to be the biggest factor in the pattern of distribution of the climate.

d. Dry climates occupy the largest extent of earth area.

18. Put the transparencies of dense population over the climatic regions map. Encourage students to make as many statements as they can concerning: 57

a. Climates of densest population.

b. Climates of sparse population.

c. Exceptions to the rule. (One of these is Java in the Tropical Rainforest Climate.)

Natural vegetation differs from place to place over the earth's surface but broad regions of similar types may be distinguished and these regions correspond closely to climatic conditions.

Note to the teacher: Excellent references for this section are Elements of Geography by Finch et al. (Chapter 20) and Man's Physical World by Van Riper (Chapter 10).

There are some excellent colored films in the ecology series that can be rented from the Visual Aid Service, University of Illinois: The Temperate Deciduous Forest. The Tropical Rain Forest, Tundra Ecology.

2. The word "natural" may create some problems because this refers to the vegetation that has not been affected by the activities of man. We know, however, that man has altered natural vegetation. Much of it has been completely eliminated (great stands of cedars in the eastern Mediterranean) and much of it has been replaced by domestic types of vegetation (long bluestem grass of the Illinois prairie has been replaced by domestic corn, soybean, and wheat) 59

   Nonetheless, the effect of natural vegetation is still very present in those areas where it has since disappeared. This is especially the case where agriculture prevails and soil continues to show the imprint of the vegetation cover under which it developed.

3. Look for such types as: 59

   Trees (coniferous and deciduous)
   Grass
   Shrubs
   Cacti
   Mosses
   Lichen
   Sedge (coarse, clumplike grass)

4. Vegetation is important to man in the following ways: 59

   a. It can be used as a resource (lumber from trees and grass for grazing).

   b. Recreational purposes (National forests for camping).

   c. Conservation measures (vegetation cover to prevent land erosion).

   d. Esthetic beauty (the sheer pleasure of looking at trees, shrubs and cacti).

   e. Soil formation. (Do not press for this answer. It will be brought out later.)

59 5. Transparency (Tr-123) and selected slides will be used to study vegetation types. Characteristic, here, refers to the appearance of the vegetation and description of the dominant plant. When referring to location, have the students point out major areas but refrain from the detailed treatment we used with climates. It is very important, however, that the students shade in their own vegetation map as you go along. The relationship that is referred to is the one between vegetation and climates. Use flashbacks to the climate map to see if any close associations can be seen. The projection is too small to bring out any close associations between vegetation and landform although they surely exist.

Use the slides and transparencies as inductively as possible. When you show the slide of a vegetative type ask the students to identify the main characteristics and then fill in where necessary. With the transparency, have the students locate with a pointer and verbally identify the areas of the vegetation types. Those students who are not actively engaged in location exercises will be busy taking notes and working with their outline maps. The colors on the student maps should conform as closely as possible to the transparency colors.

59 6. Show Slide (218) of the Heavy Tropical Rainforest. Remind the students that the slides are only intended to give them an idea of what the vegetation is like. Don't assume that the types all look like the slide. There is a variation within types.

CHARACTERISTICS

There are multi-variety, multi-storied and a large number of climbing and parasitic type plants. The Tropical Rainforest is broadleaf evergreen in character with no general period of dormacy when the forest is bare of leaves. The trees do renew their leaves each year but each species sheds at a different time and the forest is never without foliage. Undergrowth is relatively sparse due to the lack of sunlight.

LOCATION

Using Transparency (Tr-123), locate with the students, the distribution of Heavy Tropical Rainforests. The Upper Amazon Basin, the Congo Basin of West Central Africa and the East Indies are the main areas of this vegetative type.

RELATIONSHIPS

Show the composite climate map and have the students refer to their own climate map to seek relationships. There is a very close relationship here between this vegetative type and the Tropical Rainforest (wet) Climate.

7. Show Slide (219) of the Lighter Tropical Forests. 60

CHARACTERISTICS

There are single-storied and more widely spaced and smaller trees than in the Heavy Tropical Rainforests. There is usually a denser undergrowth of grass and shrub and many of the trees are deciduous in nature, losing their leaves in one season of the year.

LOCATION

Show the distribution of Lighter Tropical Forests. This vegetative type prevails in Eastern and Southern Brazil, Southern Africa, India, Interior Southeast Asia and Northern Australia.

RELATIONSHIPS

This vegetation type is closely related to the Tropical Savanna Climate and the fringe of the Dry Climates (steppe).

8. Show Slide (221) of the Mediterranean Shrub and Woods. 60

CHARACTERISTICS

This is a mixed forest of low, apparently stunted, gnarled trees with much of the ground between trees covered by a bush or shrub-like vegetation. The trees are predominantly broadleaf evergreen and instead of dropping their foliage during the dry season, adjustments are made in other ways. The trunks of some type trees develop a very thick bark as typified by the cork oak. Other trees have leaves that are thick, leathery and shiny as typified by the olive tree. Both of the devices are protective measures against excessive transpiration. The shrub and bush change color with the season, varying from a green during the moise season to a pale brown in the dry season.

LOCATION

Show the distribution of Mediterranean Shrubs and Woods. This vegetative type prevails in the Mediterranean areas, Southern Australia, Southern tip of Africa, Central Chile and Southern California.

RELATIONSHIPS

The vegetative type is closely related to the Mediterranean climates.

9. Show Slide (225) of the Coniferous Forest. 61

CHARACTERISTICS

These forests consist predominantly of needle-leaf evergreen trees. These trees do drop their needles but this is a continuous process not confined to a particular season and therefore the tree is never bare.

LOCATION

Show the distribution of Coniferous Forests. The largest areas of this vegetative type are in Northern Canada and Northern USSR, and Siberia. Other significant areas are Western United States and Southeast United States including the Florida Peninsula.

RELATIONSHIPS

This vegetative type has its greatest areal extent in the high middle latitudes where it corresponds very closely to the Subarctic type climate. These forests have been given the name taiga. In the lower middle latitudes there is a close relationship with the Marine West Coast Climate in western United States. This is a very valuable forest stand and the leading tree is the huge Douglas Fir. In the Southeastern U. S., very fine stands of pine forests can be found. These pines adapt well to the poor sandy soil that seems offensive to most species of broadleaf trees in this area.

61 10. Show Slide (222) and (223) of the Mixed Broadleaf and Broadleaf/Coniferous Forests.

CHARACTERISTICS

These forests consist mainly of a wide variety of broadleaf deciduous type trees with the dominant tree species differing from one region to another. Toward the poleward margin, coniferous type trees become mixed in with the broadleaf varieties.

LOCATION

Show the distribution of Mixed Broadleaf and Coniferous Forests. This type prevails in Eastern U. S., Southern Chile, Northern and Western Europe extending into the USSR and Southwest Siberia, Manchuria, Korea, Southeastern China, Southern Japan, Southeastern Australia and New Zealand.

RELATIONSHIPS

The vegetative type is closely related to several climatic types: Humid Subtropical, Humid Continental and Marine West Coast. It is a mid-latitude type vegetation and all these are humid mid-latitude climates.

62 11. Show Slide (228) or (228. 2) of the Middle Latitude Grassland.

CHARACTERISTICS

Compared to the Tropical Grasslands, the Mid-latitude Grassland vegetation is less tall, more evenly spread, and less coarse in nature. Of course, there is variety within the classification ranging from tall (5-8 feet) grass in the more humid sectors to short bunch grass in the subhumid sector has gone under the plow of man.

LOCATION

Show the distribution of Mid-latitude Grasslands. This vegetative type is most prevalent in the Pampas of Argentina, Central United States and Canada, S. E. Europe, Southern USSR, Near and Middle East, Asia and the Interior of China.

RELATIONSHIPS

This vegetative type shows strong relationships to the steppe climates and the drier parts of the Humid Continental Climates and also to the Humid Subtropical Climates.

12. Show Slide (226) of the Tropical Grasslands. 62

CHARACTERISTICS

There is a great deal of variation within this particular vegetative classification. It may range from an area of continuous grassland and virtually no trees to a grassland with a liberal sprinkling of small trees. The grass itself presents a problem because it varies from 1-2 feet in South America to 5-15 feet in Africa. It is a coarse grass and most often found in bunches with much bare earth between bunches. Tropical grasslands are popularly known as "Savannas."

LOCATION

Show the distribution of Tropical Grasslands. This vegetative type is most prevalent in Venezuela (Llanos), Central Brazil, Central Africa and Australia.

RELATIONSHIPS

This vegetative type is closely related to the Tropical Savanna and Steppe Climates.

13. Show Slide (229) or (229. 1) of the Desert Shrub and Waste. 62

CHARACTERISTICS

Most desert areas of the world have vegetation of some type varying in nature from a short bunch grass in the steppe areas to the cacti and shrub in the more arid desert areas. The cacti have a number of devices that aid in retaining moisture. Thick, leathery, non-porous leaves retard the rate of transpiration. The bodies of the cacti are usually large and serve as moisture reservoirs. Spines keep animals away from the moisture laden leaves. Some desert plants depend entirely on the erratic rainfall, developing very rapidly and then dying when the moisture has gone.

LOCATION

Show the distribution of Desert Shrub. This vegetative type is most prevalent in S. W. United States, Peruvian-Atacama, Western and Southern Argentina, S. W. Africa, the Sahara, Saudi Arabia, Central Asia, Central China, Western Pakistan and Australia.

RELATIONSHIPS

This vegetation, of course, is closely related to the Dry Climates of the world.

63 14. Show Slides (230) and (231) of Tundra vegetation.

CHARACTERISTICS

Mosses, lichens (mosslike plants consisting of algae and fungi) and sedges (short, coarse, bunch-grass) are the most common of the Tundra vegetation. Also to be seen, especially in late June and early July, are a large variety of tiny flowering herbs that add color to an otherwise drab landscape. The true tundra is treeless, and only as you approach the boundary of the taiga to the south are dwarfed trees encountered.

LOCATION

Show the distribution of the Tundra. This vegetative type prevails along the Polar margins of North America and Eurasia, along the perimeter of Greenland and Iceland.

RELATIONSHIPS

This vegetation is quite appropriately related to the Polar (Tundra) Climates.

63 15. Hopefully, the central ideas will be concluded:

a. Natural vegetation differs in type and amount over the earth's surface.

b. Broad patterns of similar types can be distinguished.

c. These patterns appear to be related to the climatic conditions.

63 16. Use the population overlay on the vegetation map to consider this relationship. Also have them refer to their individual work maps. The students should be able now to formulate a number of important statements that give evidence of deepening insight into the relationships between vegetation and where man lives.

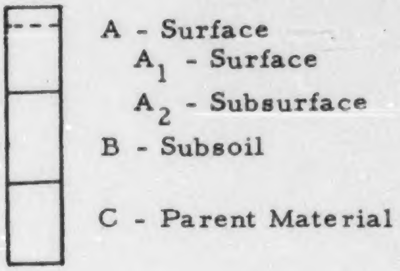
The soils of the earth are different from place to place but large regions of similar types may be discerned. These regions are closely related to the other elements of the physical environment, that is to Climate, Vegetation and Landform.

2. Allow the students 2-3 minutes to write a definition of soil and then ask several students to volunteer their answers. Next, ask the class to read the short excerpt--"What is Soil?" Discuss the reading and encourage the students to include the essentials in their notes. 65

3. List the various factors on the board that the students mention in discussion. Did anyone give man as a factor? 65

4. Have the students read "Factors in Soil Formation." This reading is most suitable for a homework assignment. If used in this manner have the students make an outline of the reading for discussion the following day. If the teacher has the reading done in class, take one section at a time with the teacher leading the discussion. 65

5. Encourage the students to express their ideas about this question. Then have them read "Soil Profiles" and, together with the teacher, outline the profile that appears in the teacher and student manual and develop a good definition. A soil profile is a vertical section through the horizontal layer or layers that lie parallel to the earth's surface. 65



6. Assign this section to be studied carefully for homework and then discuss and clarify on the following day. The best references are Physical Geography by Strahler (Chapters 16 and 17) and Elements of Geography by Finch, et al. (Chapters 21 and 22). 65

7. For each soil type, we are interested in the four major points that you will find in the student's manual. 66

   The location of the soil type should be done in the same manner as it was for the other elements. Using the transparent overlays, have the students locate and identify the areas on the earth's surface where a particular soil type prevails. Be sure that the students shade in their own soil map.

To bring out relationships, show the climate and vegetation overlays so that comparisons may be made to the soil regions. Use the slides of soil profiles to analyze the characteristics of the particular soil type. Have the students color their profile block to conform, as close as possible, to the slide. Emphasize the most important characteristic of each soil type.

Give a brief statement as to the agricultural worth of the soil.

67 8. Using Transparency (Tr-124) show the distribution of Podzol soils.

LOCATION

Have a student point out and identify the areas where this soil type prevails. Remind students of their own soil maps.

RELATIONSHIPS

Compare this soil region to the regionalization of climates and vegetation. What can the students point out? They should see that Podzol soils are closely related to the Subarctic Climates and the tiaga vegetation (coniferous forests of the high middle latitudes).

PROFILE CHARACTERISTICS

Show Slide (232) of a Podzol type soil. This is found in Michigan. The profile characteristic will tell what a soil type typically looks like. This may be slightly different from what the slide actually shows because of the agricultural works of man.

A_1 - Grayish brown layers of raw or semi-decomposed humus, mostly needle-leaves.
A_2 - Ashen-gray layer leached of iron and soluble minerals and void of clay particles by means of eluviation (Key Characteristic).
B - Strongly illuviated brown layer.
C - Usually glacial material.

The process of podzolization giving rise to the podzol and podzolic type soils takes place in the cool, humid parts of the world. It consists of soil leaching by highly acidic soil solutions. The acid stems from plant and animal organisms which decay very slowly in the cool climates. Coniferous needles and twigs that litter the forest floor, themselves, give off an acidic residue and greatly aid the podzolization process. The percolating acidic solution removes almost everything from the A layer except a coarse sand sized particle that is bleached and void of almost all soil nutrients. The strong acidity is also offensive to earthworms that normally mix the upper layers, thus in their absence the line between layers is very sharp.

AGRICULTURAL WORTH

It must be remembered that there are no soils whose fertility cannot be improved by some means of corrective measurements. Podzol soils, however, in their natural state are generally poorly suited to agricultural use but respond well to improvement methods. Berries (blueberries), potatoes, turnips and hardy grains (barley and rye) are able to thrive in this soil.

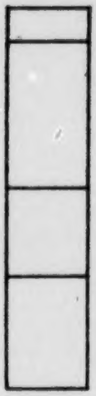
9. Show the distribution of Podzolic soils. 67

LOCATION

Have a student locate and identify regions of Podzolic soils.

RELATIONSHIPS

Show Slide 233.1 of a Podzolic type soil. This is found in eastern Illinois.



A_1 - Dark brown accumulation of organic materials 3-5 inches thick, mostly leaves from deciduous trees.

A_2 - Leached out not impoverished or greatly bleached.

B - Yellowish brown and of heavier texture than A layer. The A and B horizons are often not clearly separated.

C - Usually glacial material or loess, a very uniform windblown silt

Podzolic soils are often referred to as gray-brown podzolics. They are associated with the deciduous broadleaf forests of the cool, humid middle latitudes. The residue that is derived from the leaves and twigs of the broadleaf forest is more basic than that of the coniferous forest, therefore the A_2 layer is not impoverished as in the true podzol. Earthworms also readily mix the organic material in this soil making the upper layers less sharply defined.

AGRICULTURAL WORTH

Podzolic soils are quite suitable to a wide variety of crops.

68 10. Show the distribution of Latosolic Soils.

LOCATION

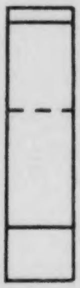
Have a student locate and identify regions of Latosolic soils.

RELATIONSHIPS

This soil type is closely related to the Tropical climates and the Tropical vegetation - rainforests, lighter forests and some grasslands.

PROFILE CHARACTERISTICS

Show Slides (234) and (235) of a Latosolic type soil. This was found in Malaya.



A_1 - Very thin layer of organic material.
A_2 - Very thick, often over 10 feet.
B - Dark reddish layer with no clear distinction, between A and B layers. This is the Key Characteristic.
C - Broken down bedrock. This may be as far down as 100 feet.

The process of ferrallization giving rise to the latosolic type soil takes place in warm, humid regions of the world. It involves soil leaching by a mildly acidic solution. One reason for the weaker acidity is that organic matter (leaves, etc.) decays almost immediately upon reaching the ground in tropical areas. The mild acid solution completely removes from the soil all basic minerals leaving behind only the oxides of iron and aluminum throughout the soil profile, accounting for the lack of distinction between A and B layers and the very reddish color. Latosolic soils as a rule are very granular in composition as shown in Slide (235).

AGRICULTURAL WORTH

These soils are low in plant food (mineral and organic) thus appeal only to crops that can utilize the abundant sunlight and rainfall, such as bananas and cocoa.

68 11. Show the distribution of Podzolic-Latosolic Soils.

LOCATION

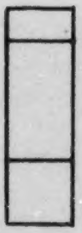
Have a student locate and identify regions of this soil type.

RELATIONSHIPS

This soil type is closely related to the Humid Subtropical Climates but shows little relationship to any particular type of vegetation.

PROFILE CHARACTERISTICS

Show Slide (236) of a Podzolic-Latosolic type soil.



A - Relatively thin, brown A layer high in clay content.

B - Deep, fine textured and light colored red and yellow.

C - Broken down bedrock.

These are transitional soils of the low middle latitudes and they have some characteristics of both podzolization and ferrallization. Organic matter does not decay as fast thus there is a thicker layer of humus. Ferrallization is present accounting for the red and yellow soils but it is not complete probably because of the difference in rainfall conditions. Podzolization accounts for a B layer that is relatively high in acid content.

AGRICULTURAL WORTH

The agricultural capacity of these soils is not high but they respond well to fertilizers because of their fine textures. Much of the agricultural soils of the southeastern United States are kept in continuous cultivation by very heavy applications of fertilizer.

12. Show the distribution of Chernozemic Soils. 69

LOCATION

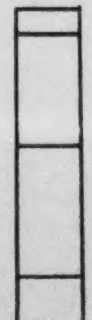
Have a student locate and identify regions of Chernozemic soils.

RELATIONSHIPS

This soil type is closely related to the steppe regions of the Dry Climates and on the drier margins of the Humid Subtropical and Humid Continental Climates. In India it can be found in the Tropical Savanna Climate but this is not a true chernozemic soil. In regard to vegetation this soil type is closely associated with the Middle Latitude grasslands.

PROFILE CHARACTERISTICS

Show Slides (237) and (238) of Chernozemic soil. This was found near LaSalle, Illinois.



A_1 - Dark black layer of humus, mostly decomposed grass.

A_2 - Thick A layer dark brown to black in color denoting a very high humus content. This is the Key Characteristic.

B - Lighter brown, often contains depositional layer of lime (see Slide 238).

C - Glacial drift or loess.

Chernozemic soils are normally found in the mid-latitudes where rainfall supply is not great but is sufficient enough to support a dense growth of grass. The annual growth and death of these grasses has built up a large A horizon that is very dark and rich in humus. Due to the modest rainfall, these soils are less leached than the previously considered soils and by comparison are high in calcium (base). They also have a fine granular texture and hold moisture very well.

AGRICULTURAL WORTH

Chernozemic soils are excellent agricultural soils, probably the best. Their high humus contents, good structure and good water holding capacity make them ideally suited for grains and other extensive field crops.

69 13. Show the distribution of Desertic Soils.

LOCATION

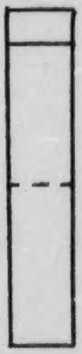
Have a student locate and identify regions of Desertic Soils.

RELATIONSHIPS

The soil type is closely related to the Dry Climates and the Desert type vegetation.

PROFILE CHARACTERISTICS

Show Slide (239) of Desertic Soil. This was found in Shoshone, Wyoming.



A - Mostly bare to very thin layer of organic matter.

B - Horizons are either absent or very difficult to distinguish. Soils are very low in organic matter and as a result the lighter colors predominate, that is, the reds, yellows and light browns.

C - Broken down bedrock.

Desertic soils develop under very sparse vegetation and therefore tend to be lighter colored than soils with higher humus content. Leaching is at a minimum, thus these soils are normally very high in basic minerals, in lime, calcium and sodium. Their texture is generally coarse and often includes a large amount of undecomposed rock fragments, (See Slide 239). Mature profiles, when they exist, are quite shallow.

AGRICULTURAL WORTH

These soils have little agricultural value without irrigation and the addition of nitrogen and organic material.

14. Show the distribution of Chernozemic-Desertic Soils. 70

LOCATION

Have a student locate and identify regions of this soil type.

RELATIONSHIPS

This soil type is most closely related to the steppe regions of the Dry Climates and to the Grasslands, both middle latitude and tropical.

PROFILE CHARACTERISTICS

Show Slide (240) of the Chernozemic-Desertic Soil.

A_1 - Thin layer of humus, usually grass and grass roots.

A_2 - Brown layer, but lighter colored than chernozemic because of a thinner grass cover.

B - Light brown B layer often a zone of lime accumulation.

C - Glacial material or broken down bedrock.

This is a transitional soil type occupying a position between the light colored desert soils on the dry margins and the very dark chernozems on the humid margins. They form under a cover of grass that is shorter and not as deep rooted as the grass that is associated with the chernozemic soils. Precipitation is slight but sufficient enough to leach lime out of the A and into the B horizon bringing about a horizon that is light brown in appearance.

AGRICULTURAL WORTH

In general these soils are easily tilled, but they are marginal for agriculture mainly because of the inconsistency of rainfall. Most often these regions are devoted to livestock grazing.

70 15. Show the distribution of Tundra Soils.

LOCATION

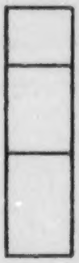
Have a student locate and identify regions of this soil type.

RELATIONSHIPS

This soil type is related to the Polar Climates (tundra) and to the Tundra type vegetation.

PROFILE CHARACTERISTICS

Show Slide (241) of Tundra Soil. This soil is poorly drained but not frozen. It was found near Platinum, Alaska.



A - Dark brown, peaty surface layer.

B - Gray horizon, appearing somewhat like a podzol soil.

C - Permafrost.

Well developed soil profiles are not found very extensively in the Tundra. Much of the soil is underlain by permafrost, a zone of permanently frozen ground that lies beneath the tundra surface and prevents a continuous downward percolation of water. The soils, therefore, are often poorly drained and take on the characteristics of a bog or marshland. In places, a distinct gray B horizon is developed, provided the permafrost lies far enough below the surface.

AGRICULTURAL WORTH

Most of the Tundra soils cannot be drained much less tilled and support a natural vegetation that is only suitable for pasture (raindeer). Some of the better drained land that is properly exposed to sunlight is suitable for crops that have a very short growing cycle.

71 16. Show the distribution of Alluvial Soils.

LOCATION

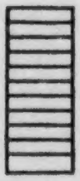
Have a student locate and identify places where this soil type prevails.

RELATIONSHIPS

Alluvial soils are not related to any particular climate or vegetation but rather to areas of the world where sediment has been deposited on the banks of overflowing streams and in delta areas near their mouth.

PROFILE CHARACTERISTICS

Show Slide (242) of Alluvial Soil.



- Multi-layered sediment deposited periodically by flooding streams.

It is difficult to generalize about the characteristics of alluvial soil because the soil is made up of the source materials from which the alluvial products originated. If a stream has its source in a sandy area, the alluvial soil will probably be very sandy in texture. Colors may vary from the very light to very dark. The periodic deposition of sediment disturbs the processes that lead to the formation of a mature profile, but if undisturbed, eventually a profile will develop that is characteristic of the region in which it is located.

AGRICULTURAL WORTH

Some Alluvial soils are poorly drained and not very productive but as a whole they are easily cultivated and rather rich in plant nutrients. "Intensive" agriculture is often found on Alluvial soils.

17. The students should see that Podzolic and Alluvial soil regions are also regions of dense population. Has anyone observed that the excellent Chernozemic soil regions are relatively sparse in population. The likely reason for this is their location in the interior of continents away from major water bodies which, for many reasons, attract people. 71

18. Look for good concluding statements here. The following are examples: 71

    a. Soils are different from place to place.
    b. Regions of soils with like characteristics can be distinguished over the earth's surface.
    c. These soil regions often show close relationship to climate and vegetation regions.

COURSE II

UNIT I -- MAN AND HIS PHYSICAL ENVIRONMENT

SURFACE OF THE EARTH

> "Underlying all the great domestic and international issues of our time are the facts of man's relation to the earth on which he lives." (Preston James, Geography of Man)
>
> Before we begin to consider issues of a social, economic or political nature, we will examine the natural features of this earth upon which man lives and with which he is forced to relate.

1. Consider the situation of Jim Jones, a young man of 19 who was born and reared on a farm in East Central Illinois. He learns that the Peace Corps is looking for people with agricultural experience that may be helpful to other people in developing countries in other parts of the world. He applies for admission, is selected, is intensely trained in the language and customs of the foreign country and sent on his two-year assignment. This represents Jim's first trip away from the American Midwest. You will now see several colored slides. The first two will give you some idea of Jim's homeland, the others are places that Jim visited after leaving the farm. Make brief notes about what you see in each place.

Slides 209 and 210 ______________________________

Slide 211 ______________________________

Slide 212 ______________________________

Slide 214 ______________________________

Slide 215 ______________________________

2. On the basis of these slides what impressions do you think that Jim received of the earth as he traveled from place to place? Write answers below.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

3. Can you account for the differences that Jim observed in the places he visited? (We are not concerned at this time with how the differences came about--processes--but merely what the differences are.)

a. ______________________________

b. ______________________________

c. ______________________________

d. ____

4. Suppose now that we look at two other places that Jim visited during his travels. Both are some distance from Jim's farm home in East Central Illinois. What impressions do you think they made on Jim?

Slide 216 ____________________________________

Slide 217 ____________________________________

5. Your teacher will ask a question at this point.

a. ____

b. ____

c. ____

d. ____

e. ____

6. Now, refer to your responses to questions 3 and 5 where we considered the various factors or elements that accounted for differences that were found from place to place during Jim's travels. What methods can you suggest to group the larger number of elements into broader categories?

a. ______________________________

____

____

b. ______________________________

____

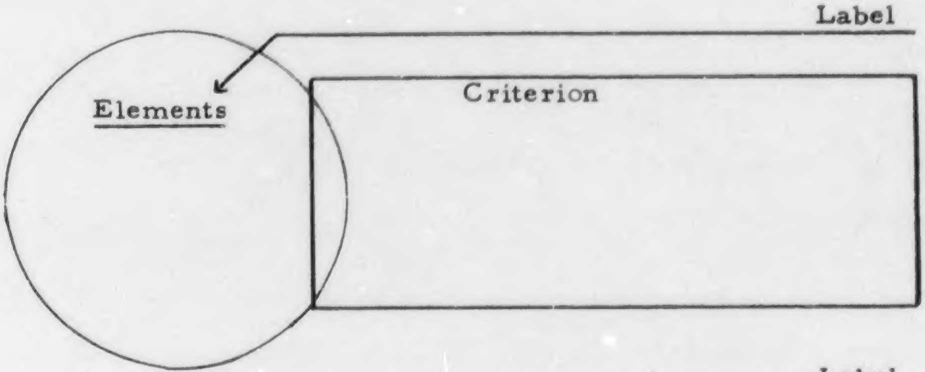
____

c. ______________________________

____

____

7.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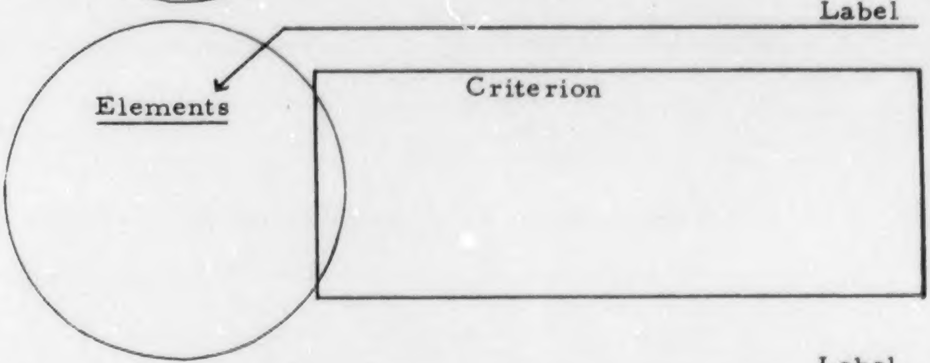
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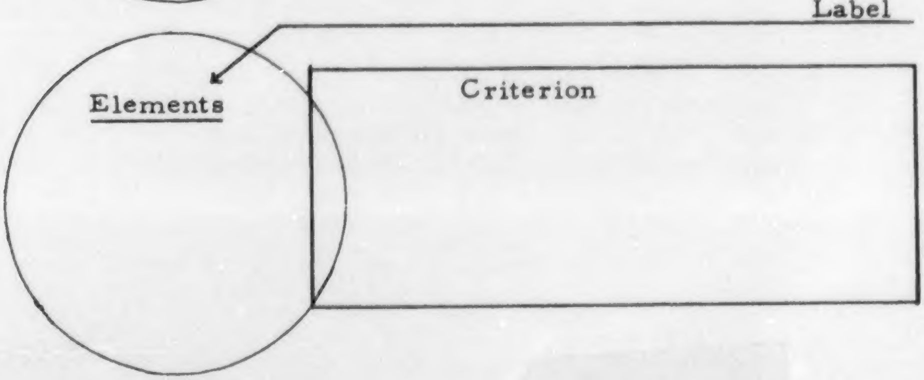
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Elements
Criterion

8. On the basis of our study thus far, what generalizations can you make about the surface of the earth upon which man lives?

   a. ______________________________

   ____

   ____

   b. ______________________________

   ____

   c. ______________________________

   ____

1. The map is by far the most widely used tool to illustrate the manner in which an element--it may be any element such as people, plains or pine trees--is distributed (or spread) over the surface of the earth. Another means of showing distribution is the photograph and in this age of space exploration exact reproductions of large areas of the earth surface are now possible and these will surely be used more frequently to illustrate the distribution of elements.

2. The purpose of a map is said to be the opposite of the purpose of a microscope.

   a. What is the purpose of a microscope? ______________________________

   ____

   b. What then is the purpose of a map? ______________________________

   ____

3. If a map is a reduction of the real earth surface, this representation must be done to scale. The idea of scale becomes very important in the use of maps. All too often scale is thought of merely as a "measuring device" to determine distance on the map or globe with little thought given to "why" a measured distance on the map gives a specified distance on the earth depending on the scale.

4. Your teacher will show you some transparent overlays that relate to map scale. Answer the following questions.

   a. First of all, what would be the scale of a map the actual size of the earth surface? ______________________________

   ____

   b. What does the scale of the map of Freshville tell you? ______________

   ____

   c. What does the scale of the map of Corny County tell you? ____________

   ____

   Are points of interest on the map of Corny County more specific or more general in detail than on the map of Freshville? ______________________

   ____

   Can you draw a conclusion about scale? ______________________________

   ____

   ____

d. What does the scale of the map of the State of Happiness tell you? ______

______

e. What do you think the State of Happiness would look like on a world map with a scale of 1 inch to 750 miles? ______

______

______

5. The process of transforming the earth's spherical surface to the plane surface of a flat map is called "projection." In this process, problems arise and various changes or deformities occur. Can you tell what they are?

______

______

______

6. The lines of latitude and longitude on the globe each have certain characteristics.

a. What can you tell about the characteristics of the lines of latitude?

______

______

______

b. What can you tell about the characteristics of the lines of longitude?

______

______

______

c. ______

______

______

______

7. Your teacher will show you a series of overlays. Answer the following questions.

   a. What distortions have come about on the conical projection?

   b. What distortions have come about on the plane projection?

   c. What distortions are evident on the cylindrical projection?

   d. Where is the point of least distortion on each map?

8. If we examine the many parts of a map we find a combination of line, point, and area symbols. Observe carefully the following transparent overlays. Each addition represents an important feature of a complete map. Identify each feature as to: (1) A line, point, or area symbol. (2) The role the symbol plays on the map.

   a.

b. ______________________________

____

____

c. ______________________________

____

____

d. ______________________________

____

____

e. ______________________________

____

____

f. ______________________________

____

____

9. Can you suggest what else must be included in order for this illustration to become a more complete map. Provide reasons with your answers.

a. ______________________________
b. ______________________________
c. ______________________________
d. ______________________________

> "To know the nature of population distribution is basic to the study of human societies and human institutions." (Preston James, A Geography of Man)

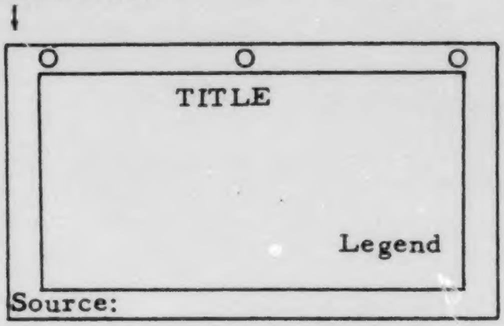
1. You recall that in Section I, we grouped the many elements that prevail on the earth surface into three major categories. One of the categories--Man--will now be considered. The concern will be with the present distribution of man (human population) over the earth surface and factors contributing to this distribution.

2. Using the Population Statistics, Column I on page 16 prepare a graph on which you plot and correctly label the data for the world population.

3. Helpful hints on graph construction.

   1. Plot points in pencil using small dots, and then connect dots with pencil.
   2. Use ballpoint pen or regular pen for all lettering. (Please PRINT)
   3. Use 3-hole graph paper No. 12-282 (Two students may share a package.)
   4. Use as much of the vertical and horizontal axis as you possibly can and still get on all the information.

Population in millions
or thousands



POPULATION
on
vertical axis

DATES on horizontal axis

4. Now using your new graph, write a short descriptive paragraph, which analyzes the population trend over the past 10,000 years.

5. What reasons can you give for this trend?

6. You may want to compare the rate of world population change between 1900-1950 with that of your state and perhaps your own city. What do you find? (Information Please Almanac can be helpful for state figures.) To figure the rate of change formulate the following fractions--

$$\frac{\text{Amount of change 1900-50}}{\text{Amount of population initially (1900)}}$$

Then simply divide the figures to convert from a fraction to a percent.

7. (Teacher direction)

8. What problems are posed by the situation that you say is developing?

9. (Teacher direction)

10. Now we'll examine another set of statistics. Using the data given in Column II on page 16 Percent of Rural and Urban Change, prepare one graph using the following scheme.

Rural (solid line)————————
Urban (broken line)---------

11. Again, write a concise paragraph analyzing this population trend over the past 150 years.

12. What reasons can you give for this trend? Where else in the world is this happening.

13. (Teacher direction)

14. Given the situation in question 11, do you see any potential problems arising with urbanization? Note them below.

15. Read The City May Be As Lethal As The Bomb.

    a. Historically, what has the city meant to society?

    b. What other places are experiencing the trend of urbanization that we find in the U. S.

16. When you consider the analysis that you made in questions 3 and 10, what conclusion can you draw about the resulting nature of population distribution?

17. Are you familiar with any other trends in population taking place in or around urban areas?

18. (Teacher direction)

19. Now, study the world map that is projected on the screen. Can you locate and identify the areas of high population density? As the areas are identified begin to develop your own population map that you find in your manual. Your teacher has special instructions for you.

20. Also locate the major void areas in the world. (Areas where people are notably few in number.)

POPULATION STATISTICS

COLUMN I

TOTAL WORLD POPULATION

COLUMN II

PERCENT OF RURAL AND URBAN CHANGE

UNITED STATES (% of Total)

Date	Urban	Rural
1810	7.3	92.7
1820	7.2	92.8
1830	8.8	91.2
1840	10.8	89.2
1850	15.3	84.7
1860	19.8	80.2
1870	25.7	74.3
1880	28.2	71.8
1890	35.1	64.9
1900	39.7	60.3
1910	45.7	54.3
1920	51.2	48.8
1930	56.1	43.9
1940	56.5	43.5
1950	59.6	40.4
1960	63.0	37.0

Source: 1960 Census of Population, Vol. I, Part A and Vol. I, Illinois. U. S. Dept. of Commerce, Bureau of the Census.

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POPULATION

(Number of live births per 1000 population) (No of deaths/1000 pop. excl. foetal death

Country	Crude Birth Rates	Crude Death Rates	Difference (Natural Increase)
Africa			
Ghana[1] (1960)	55.8	22.7 (1959)	33.1
South Africa[2] (1962)	24.5	9.0	15.5
N. America			
Canada (1962)	25.3	7.7	17.6
U. S. A. (1962)	22.3	9.4	12.9
Cent. America			
Costa Rica (1962)	42.2	8.5	33.7
El Salvador (1962)	48.4	11.5	36.9
Mexico (1962)	44.7	10.6	34.1
So. America			
Argentina (1962)	22.1	8.0	14.1
Chile (1962)	34.4	11.9	22.5
Surinam (1961)	44.5	8.2	36.3
Asia			
China (Taiwan) (1962)	37.4	6.4	31.0
Israel (1962)	25.0	6.0	19.0
Japan (1962)	17.0	7.5	9.5
Europe			
Belgium (1962)	16.8	12.5	6.3
Bulgaria (1962)	16.7	8.7	8.0
France (1962)	17.7	11.5	6.2
W. Germany (1962)	18.1	11.1	9.0
Hungary (1962)	12.9	10.8	2.1
Italy (1962)	18.7	10.1	8.6
Norway (1962)	17.3	9.3	8.0
U. Kingdom (1962)	18.3	11.9	6.4
Yugoslavia (1962)	22.0	9.9	12.1
Oceania			
Australia (1962)	22.1	8.7	13.4
U.S.S.R. (1962)	22.1	7.5	14.9

---

[1] This data comprises about 12% of the total population and is not representative of Ghana.

[2] White population only.

Statistical Yearbook 1963, Statistical Office of the U. N., N.Y. 1964. pp. 44-49.

Estimated Rate of Population Increase for the World by Continents and Regions

	Adjusted extimate of midyear pop. (millions) 1962	Annual rate of increase 1958-62 %	1960-62 %
World Total	3135	2.0	2.1
Africa	269	2.3	2.4
Northern Africa	92	2.3	2.3
Tropical and So. Africa	177	2.3	2.5
America	430	2.3	2.2
North America	206	1.7	1.6
Middle America	71	2.9	2.9
South America	153	2.8	2.7
Asia	1764	2.3	2.3
S.W. Asia	80	2.3	2.6
S. Cent. Asia	586	2.2	2.3
S.E. Asia	230	2.6	2.7
East Asia	868	2.3	2.3
Europe	434	.9	.9
N. Europe	145	.9	1.0
Cent. Europe	141	.9	.9
So. Europe	148	.8	.8
Oceania	17.2	2.2	2.2
U.S.S.R.	221	1.7	1.7

Statistical Yearbook 1963, Statistical Office of the U. N., N.Y. 1964. p. 43.

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THE WORLD'S DISTRIBUTION OF LAND AND PEOPLE

	1950 population (millions)	Cultivated acres (millions)	Present acres per person	Total arable acres (millions)	Potential acres per person
Asia	1,272	787	.6	1,014	.8
U.S.S.R.	200	556	2.8	586	2.9
Europe	394	363	.9	388	1.0
Africa	199	458	2.3	655	3.3
North America	166	595	3.6	859	5.2
Latin America	162	158	1.0	321	2.0
Oceania	13	47	3.6	77	6.0
World	2,406	2,838	1.2	3,774	1.5

Data from F.A.O. Yearbook, 1950. The figures in the last column are based on 1950 population.

* * * * * * *

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In class for the next few weeks the topics of discussion will be four elements of man's natural environment--land formation, climate, vegetation and soil. During this same time you will be expected to conduct a field study out of class.

You are to select an area of earth surface from 1-2 acres in size. (A square acre is approximately 210 feet to a side.) This land should be relatively free of cultural features. You may want to pick an area on the outskirts of the city or perhaps in a park. It would be best, however, to locate well apart from human dwellings.

FIELD PROBLEM - EVALUATION FORM

Location

1. Illustration of the size and shape of the total area. (Orientation to north)
2. Descriptive location.
3. Latitude and longitude location. (Degrees, minutes and seconds from quadrangle map.)
4. Location within a state, county, township, section and quarter-section.

Landforms

1. Profile illustration of your land showing the relief. (Made to scale)
2. Manner of draining the land.
3. The larger drainage system within which your area is located.
4. The larger landform region within which your area is located.
5. A three dimensional model illustrating the landform of your area. (Clay, papier-mache, salt-water-flour mixture, contour overlays are suggestions)

Climate

1. The larger climatic region within which your area is located.
2. Climatic elements. (Charts or graph where possible)
    a. Precipitation (amount, kind and distribution).
    b. Temperature (monthly averages, maximum and minimum reading).
    c. Winds and percentage of sunshine if possible.
    d. Other special features of the climate.

Vegetation

1. The larger vegetation region within which your area is located.
2. Vegetation map of your area.
3. Identification of as many vegetation types as possible.

Soil

1. The larger soil region within which your area is located.
2. Any information conveying the color, texture and layering of the soils.
3. A small sample of different layers would be excellent. (In plastic vials)

Relationships

1. Note any relationship that exists between the elements of the physical environment. (Example: A difference in soil because of a change in landform.)

Land use and Prospects

1. Present use of the land.
2. Prediction as to future use of the land.

1. Return to Part I Section 7. Note below the various elements that you come to understand as making up man's physical environment.

2. Begin with landforms. How many different types of land formations can you name?

3. You can see that the list can be quite long and to study all the features would be a major task. For our purpose we will study three major classes of landforms:

   ____________, ____________, ____________

4. What is your definition of:

   a. ____________

   b. ____________

   c. ____________

5. In the study of earth landforms there are a lot of questions that can be raised such as: What criteria would you use in defining a mountainous area? When do mountains become hills? Must a plains area be perfectly flat? These are difficult questions and perhaps none of them will be answered to your satisfaction but we must try to reach some common agreement for the sake of communication. Read the short article Physical Landforms, p. 46 , and answer the following questions:

   a. In his attempt to define various landform areas, Van Riper uses the term "Local relief". What does this mean to you?

b. What are the essential characteristics of each landform type?

Mountains ______________________________

____

Plains ______________________________

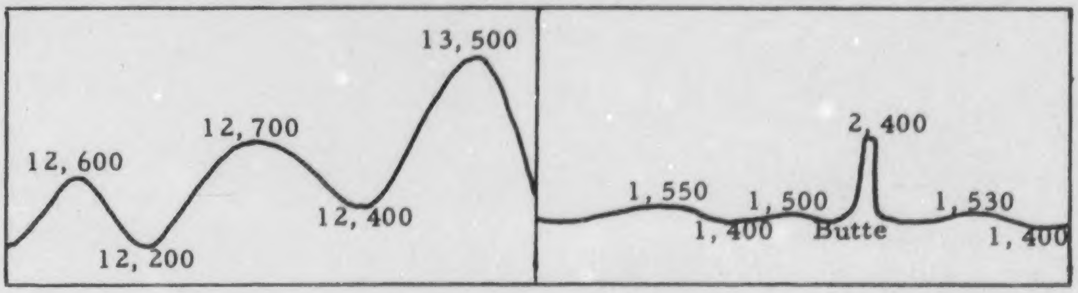
____

Hills ______________________________

____

c. In the two illustrations below what landform area is depicted?

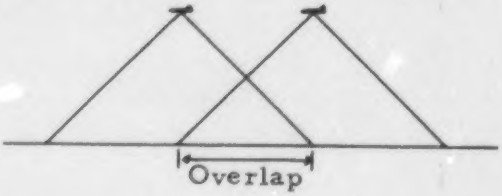
Landform Type? ______________ Landform Type ______________



6. "Local relief" can become the major criterion by which a map is created to show the distribution of different landforms. This is probably different from most maps with which you are familiar that reveal the height of the land above sea level by means of selected color shadings (Ex: Green is low elevation). This method, although useful for some purposes, does not tell you anything about the forms or shapes that the land takes. This latter factor is considered very important in our studies because the nature of the land can affect other elements of the natural environment and certainly the activities of man.

7. A rather new and hopefully interesting technique will now be used to make this idea of "local relief" more meaningful to you. If you were to view a single aerial photograph with unaided eyes only two dimensions--length and width--could be perceived. You get the same effect if you close one eye and look out the window. The dimension of depth is not present. (You may think you still have some but this is the result of past learning.)

It is possible and very desirable for our purpose to have the third dimension of depth when viewing aerial photographs but a second photograph must be used. For convenience sake these separate, sequential (usually two) photographic images are made up on a single print and then viewed with a special instrument. These prints are known as stereograms. To make a stereogram, photographs are taken from a plane flying a prescribed course and taking vertical photos at certain time intervals. The time interval was such that the image included on one photo overlaps approximately half of the photo adjacent to it. Thus you have images of the same area taken from different positions. This overlapped area (see diagram below) is then viewed with a stereoscope. This simple instrument deflects normally converging lines-of-sight so that each eye views a different photographic image thus enabling us to gain depth or "relief" perception.



8. a. Begin by using stereogram 126. Briefly describe what you see through the stereoscope.

____

____

b. What general landform type do you think you are observing on the basis of the definition? ____________________

c. How much 'relief' do you estimate that there is between point (A) at C.1-3.4 and point (B) at A.5-3.5? ____________feet.

9. Keeping in mind Van Riper's 'local relief' criteria, turn to the Grand Teton Quadrangle map where these same two points have been marked.

a. With the aid of the contour lines, determine the amount of relief between these two points that you observed on the stereogram. __________________

b. How close was your estimate? __________________

c. If much of the land in the adjoining area had relief of this amount what kind of landform area would Van Riper consider this? __________________

10. On the outline map that you find in your manual, code and, during homework, shade in the appropriate element discussed in class. You will need a package of colored pencils for this task. Be as neat as you possibly can because you will be referring to this map and other maps quite often in the future.

11. Examine the global distribution of mountainous areas that your teacher is showing you. Color the mountain regions brown on your map.

    a. What general observations can you make about mountains? ______

    b. Can you locate and identify major mountain areas of the world? ______

    c. Can you locate and tell the significance of the Pamir Knot? ______

12. Now compare the mountain regions to the regions of dense population in the world. What do you find? ______

13. Now look at a second stereogram. (132)

    a. Briefly describe what you see. ______

    b. What general landform type are you observing here? ______

    c. The idea of "local relief" must have influenced your thoughts. How many feet of relief do you think there is in this area? (Especially between a point located at B. 6-1. 7 and a point at A. 8-3. 8). ______

d. Does the nature of the river give you any clues about the nature of the land shapes? ____________________

____

e. What characteristic would you say this river has? ____________________

____

14. Turn to the topographic map (Crowder Quadrangle) of Quitman county, Mississippi and locate the photographed area on this map.

a. How many feet of relief do you find when you consider the land between the two points that were marked on the photo? ____________

b. How does this compare with your visual perception? ____________

c. Specifically, what kind of landform area would this be? ____________

15. Another Stereogram is 187.

a. What observations can you make here? ____________________

____

____

b. How much "relief" is there in this area? ____________

c. What landform type would you give to this area? ____________

16. Use the Beechey Point, Alaska topographic map to verify your statements in question 12.

a. How much relief do you actually find here? ____________

b. What type of landform area is this? ____________

17. Now examine the global distribution of plains. For identification purposes it is best to consider five different kinds of plains. What is your definition of each type of plain? Can you locate and identify examples of each? Color the plains regions green on your map.

Coastal Plains ____________________

____

Interior Plains ______________________________

____

Alluvial Plains ______________________________

____

Delta Plains ______________________________

____

High Plains ______________________________

____

18. Compare the plains of the world to the areas of dense population. What do you find? ______________________________

____

____

____

19. Yet another landform type can be seen on Stereogram 135.

a. How would you describe it? ______________________________

____

____

b. What do you estimate the relief to be between a point located at B. 65-1. 75 and a point at B. 6-2. 55. ______________

c. Does the nature of the road (narrow white line) give any indication as to what the landforms may be like? ______________________________

____

d. What type of landform do you think this is? ______________________________

20. a. After you have located the two points on the West Virginia Topographic map (Holden Quadrangle), determine the amount of relief. __________ feet.

b. What variation in relief do you find in the general area in which the photos were taken. ____

c. Does this amount of relief satisfy the criterion set forth for the landform type that you stated in question 19? ____________________

21. Now examine the global distribution of hills. Can you locate and identify regions in the world where hills are very prevalent? Color the hills regions orange on your map.

22. Compare the hills regions to the regions of dense population. What do you find?

23. Teacher direction.

CLIMATES

1. Now we'll consider another important element of man's physical environment--climate.

2. What do we mean when we speak of climate?

3. How does climate differ from weather?

4. What are the major elements of climate and weather?

5. How important is climate to man?

6. Assignment: Read "Climate in Everyday Life" on page 58 .

   In the space below, write answers to questions 2, 3 and 5. Check (√) your answers, above, that agree with the readings.

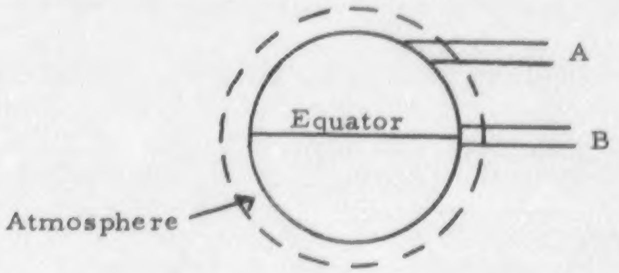
MAJOR ELEMENTS OF CLIMATE

TEMPERATURE

The sun is the only significant source of heat for the earth's atmosphere. The earth's surface receives solar energy, converts it to heat and radiates the heat to the atmosphere. Thus the principal source of heat for the atmosphere is received indirectly from the sun and directly from the earth's surface. An important(CLIMATIC CONTROL 2) enters in here because land and water surfaces differ considerably in their ability to heat up and cool off thereby having different effects on the atmosphere above.

The amount of solar energy that any particular place on the earth's surface receives in a given day (24 hours) depends on two factors:

a. The angle (or intensity) at which the sun's rays strike the earth's surface.



Note that the oblique ray (A) is spread out over a larger surface and therefore not as effective as the direct ray (B) which is more concentrated. (A) also passes through more of the earth's atmosphere and is subject to more diffusion from particles.

b. The length of time that the sun's rays are received during the given day. Seasonal differences of day length arise because of the earth's inclination on its axis.

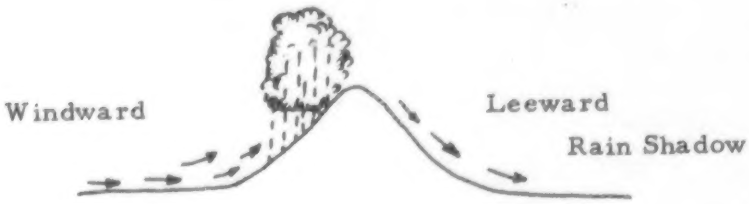
Surely you can see where latitude enters in affecting both the angle and the length of duration of the sun's rays thus becoming the second major CLIMATIC CONTROL (2)

PRECIPITATION

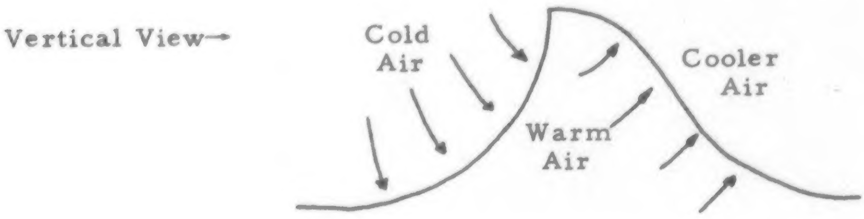
All precipitation originates in clouds and takes several different forms; rain, drizzle, snow, sleet and hail. Moisture in its gaseous form is known as water vapor and is added to the atmosphere by means of evaporation from water in the li[illegible] and solid form. Moisture is taken from the atmosphere through the process of condensation. Large scale condensation that is capable of producing abundant precipitation results from the expansion and cooling of an air mass as it rises thereby decreasing its moisture holding capacity since cool air can hold less moisture than warmer air. Rising air, no matter what the reason, has less atmospheric weight on it and therefore expands. Cooling is associated with this expansion of air. (The reverse of this principle can be shown very easily with a tire pump that becomes quite warm in its lower part as a result of compressing a large amount of air into a small area. The upper part of the pump remains relatively cool, however.) The question that now remains is how to get an air mass to rise so that it will expand and cool. There are three important ways:

a. Thermal convection. Heating of the earth surface and the air above it, causes the air to expand and rise above the surrounding cooler air. Summer thunder showers are a result of this type of lifting.

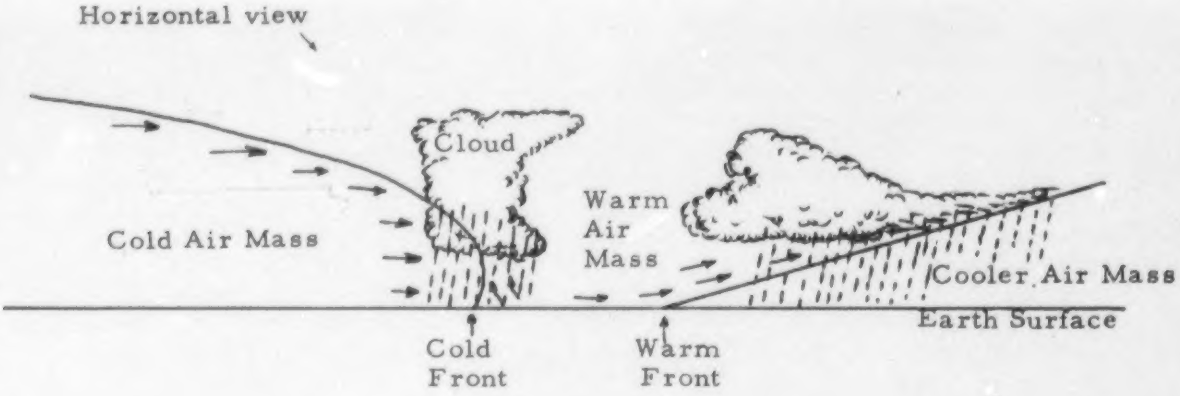
b. Orographic lifting. A large air mass can be forced to rise up when a landform barrier (CLIMATIC CONTROL - 3) is encountered by the horizontal movement of the air mass. The leeward side where air is descending is drier and is called the "rain shadow."



c. Frontal lifting. When air masses of different temperatures come together the colder and denser air presents an obstacle over which the warmer air overrides and is thereby lifted. The front is the boundary between unlike air masses (CLIMATIC CONTROL - 4). An ideal cold and warm front system (wave) on the weather map will look like this:



The illustration is a cross section through the frontal system (wave) along the red line shown in the weather map illustration. Note the warm air rising.



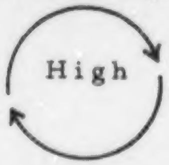
PRESSURE AND WINDS

As elements of climate, pressure and wind are much less significant than temperature and precipitation. They do, however, have direct effects upon temperatures and precipitation and, therefore, are quite important. Atmospheric pressure refers to the actual weight of the atmosphere. (A column of of air 1 square in cross-sectional area extending from sea level to the top of the atmosphere weighs about 14.7 pounds.) Pressure differences at sea level are depicted on the weather map as systems: (a) high pressure systems, called "highs" and (b) low pressure systems, called "lows". The arrangement of the pressure systems over the earth surface does not have an entirely adequate explanation. Some surely are known to have a thermal (heat) origin as for example the Equatorial Low. Some others are the result of convergence of air at higher levels and a subsequent sinking of air causing the Subtropical Highs at latitudes 30° North and South. (CLIMATIC CONTROL - 5)

The pressure systems have very different features that distinguish them from each other. These features are the following:

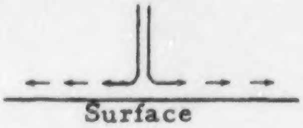
I. High Pressure System

a. A clockwise wind flow in the northern hemisphere (reverse in the southern hemisphere).



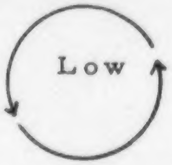
b. An area of descending or subsiding and diverging air.

c. Air that subsides and diverges at the surface is directly opposed to the development of clouds and precipitation, therefore highs are generally areas of fair weather.

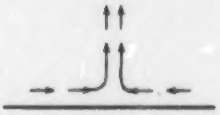


II. Low Pressure System

a. A counterclockwise wind flow in the northern hemisphere (reverse in the southern hemisphere).



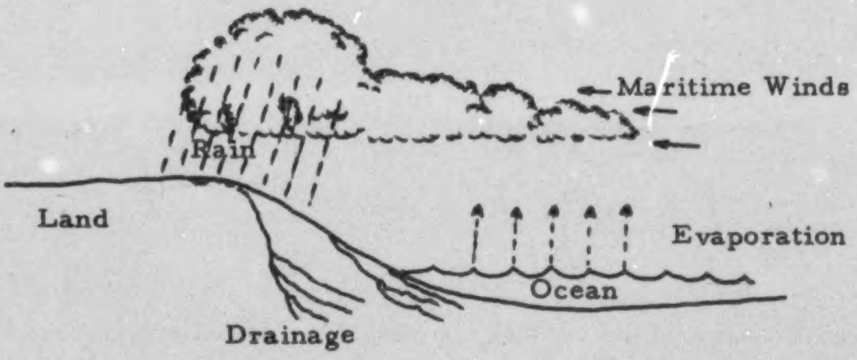
b. An area of converging and ascending air.



c. Converging and rising air is favorable to the condensing of water vapor, formation of clouds and precipitation of moisture. Lows, therefore, are generally areas of poorer weather.

The differences in pressure over the surface of the earth account for the existence of winds, and winds have two major climatic functions. These are:

1. The maintenance of a heat balance between the higher polar latitudes and the lower equatorial latitudes.
2. The transportation of water vapor from the oceans, which are the major source, to the land where the water vapor condenses and falls as rain. This is known as the Hydrologic Cycle. (See following diagram)



The winds, which, as we have learned, owe their existence to pressure difference, in turn generate waves and slow drifts of water as they blow over the ocean. These drifts of water or ocean currents (CLIMATIC CONTROL - 6) are very important to the climate of many land areas of the world and must be considered. As we might expect the ocean currents tend to pattern after the winds of the great pressure systems that are of a semi-permanent nature and prevail over the great oceans of the world.

____

____

____

Two other CLIMATIC CONTROLS should be mentioned for in certain parts of the world they are very important.

Altitude is one of these controls. Consider the Andes of Ecuador in South America and the tremendous climatic change stemming from temperature and precipitation differences, that take place between the base in the Amazon Basin to the peaks which rise to over 19,000 feet. Going up the mountain is somewhat similar to traveling poleward from the equator.

Severe storms are another climatic control that should be mentioned. The residents of mid-continent United States are almost entirely unaffected by the late summer and autumn hurricanes that play so much havoc on the southeastern United States and especially Florida. To residents of this area together with those in Japan and the Philippines just to mention a few, the severe storms are probably one of the most important controls on their total climate picture.

7. To help you in your study of climates you will be given two maps. One is an outline map of the climatic types that you will be expected to shade in as you did with landforms. The other is a map of a hypothetical continent that will help you in making generalized statements about the location of the different climatic types.

Nine different climatic types will be considered. We are interested in three major factors regarding each climatic type:

a. The characteristics of each climatic type
b. The global distribution of each climatic type
c. The typical location of this climatic type

8. TROPICAL RAINFOREST CLIMATE (TROPICAL WET)
This type of climate has two outstanding features:

a. Uniformly high temperatures throughout the year.
b. Heavy precipitation (60-100 inches/year) throughout the year with no marked dry season.

8.1 In what areas of the world does this climate prevail?

____

____

____

8.2 Turn now to your hypothetical continent. Can you make a statement about the typical location of this climate? Write in the space provided and then we'll check with other members of the class.

____

____

9. TROPICAL SAVANNA CLIMATE (TROPICAL WET AND DRY)
This type of climate is similar to the Tropical Rainforest type, but in two important respects it is different:

a. It usually has less total precipitation. (40-60 inches/year)
b. Rainfall is unevenly distributed throughout the year, there being a distinct wet and distinct dry season.

9.1 In what areas of the world does this climate prevail?

____

____

____

9.2 Where is this climate typically located?

10. DRY CLIMATE

The essential feature of this climate is that potential evaporation from soil and vegetation shall exceed the average annual precipitation.

10.1 In what areas of the world does this climate prevail?

10.2 Where is this climate typically located?

11. MARINE WEST COAST CLIMATE

This type of climate is characterized by:

a. Adequate rainfall at all seasons
b. Moderately cool summers
c. Abnormally mild winters considering the latitude
d. A high percentage of fog and cloud coverage

11.1 In what areas of the world does this climate prevail?

11.2 Where is this climate typically located?

12. HUMID SUBTROPICAL CLIMATE

This type of climate is characterized by:

a. A relative abundance of precipitation (30-60 inches/year) that is either well distributed throughout the year or else concentrated in the warm season.
b. Warm to hot summers
c. Relatively mild winters

12.1 In what areas of the world does this climate prevail?

12.2 Where is this climate typically located?

13. MEDITERRANEAN CLIMATE (DRY SUMMER SUBTROPICAL)

This type of climate is characterized by:

a. Less than a moderate amount of precipitation (15-25 inches/year) with a concentration in the winter season and the summers almost completely dry.
b. Warm to hot summers and unusually mild winters.
c. A high percentage of sunshine for the year, especially in the summer.

13.1 In what areas of the world does this climate prevail?

13.2 Where is this climate typically located?

14. HUMID CONTINENTAL CLIMATE

This type of climate is characterized by:

a. A moderate amount of precipitation (25-40 inches/year) rather evenly distributed throughout the year with summers likely to have slightly more than winters.
b. Warm to hot summers and cold winters.
c. Rapid and marked non-periodic weather changes.

14.1 In what areas of the world does this climate prevail?

14.2 Where is this climate typically located?

15. SUBARCTIC CLIMATE

This type of climate is characterized by:

a. A meager amount of precipitation (less than 15 inches/year) that is concentrated in the summer months
b. Long, bitterly cold winters and very short cool summers
c. Brief springs and autumns

15.1 In what areas of the world does this climate prevail?

15.2 Where is this climate typically located?

16. POLAR CLIMATE
This climate type is characterized by:

a. A very limited amount of precipitation (less than 10 inches/year) most of which occurs in the summer months
b. Very long, cold winters
c. Very short, cool summers

16.1 In what areas of the world does this climate prevail?

16.2 Where is this climate typically located?

17. What conclusions can you formulate about the distribution of world climates as you examine your completed climate map and the arrangement of climatic types on the hypothetical continent.

18. Now compare the regions of dense population throughout the world to the various climatic regions. What statements can you make?

VEGETATION

1. Natural Vegetation, another aspect of the natural environment, will now be considered.

2. What does natural vegetation mean to you?

3. How many different types (species) of natural vegetation can you think of?

4. How is this vegetation important to man?

   a.

   b.

   c.

   d.

5. We are going to consider nine different natural vegetation types. For each type we are interested in:

   a. The characteristics of the vegetative type.
   b. The location on the earth's surface of the vegetative type.
   c. The relationship to other elements of the natural environment.

6. **Heavy Tropical Rainforests**

   Characteristics:

Locations: ______

Relationships: ______

7. Light Tropical Forests

Characteristics: ______

Location: ______

Relationships: ______

8. Mediterranean Shrub and Woods

Characteristics: ______

Location: ______

Relationships: ____________________

9. Coniferous Forests

Characteristics: ____________________

Location: ____________________

Relationships: ____________________

10. Mixed Broadleaf and Broadleaf/Coniferous Forests

Characteristics: ____________________

Location: ____________________

Relationships: ____________________

11. Middle Latitude Grasslands

Characteristics: ______________________________

____

____

Location: ______________________________

____

____

Relationships: ______________________________

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12. Tropical Grasslands

Characteristics: ______________________________

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Location: ______________________________

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Relationships: ______________________________

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13. Desert Shrub and Waste

Characteristics: ______________________________

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Location: ______________________________

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Relationships: ______________________________

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14. Tundra

Characteristics: ______________________________

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Location: ______________________________

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Relationships: ______________________________

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15. What conclusions can you now draw about Natural Vegetation?

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16. Now compare the various vegetative regions to the regions of densest population. What do you find?

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SOIL

1. Soil, a fourth element of the physical environment, will now be considered.

2. What is your definition of soil?

3. What are the major factors in the formation of soil?

4. Read, "Factors in Soil Formation." What can you now add to your answers to the above question?

5. What is a soil profile?

6. The parent material from which it is formed is the beginning for any soil. It may consist of a number of materials such as:

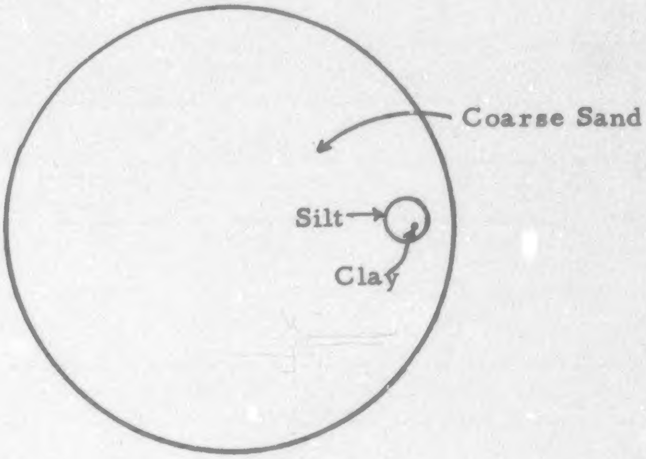
   a. Material deposited by a flooding stream (alluvial sediment).
   b. Glacial material such as drift or loess which is wind blown silt.
   c. Broken down bedrock.

Soil-forming processes begin to act immediately on this parent material. These processes operate from the surface downward causing differences in color, texture, composition and other properties to eventually occur at different depths. Three processes that are very important are the following:

a. Leaching - the removing of minerals in solution from the upper layers by means of percolating ground water.
b. Eluviation - the washing downward of fine soil particles by means of percolating ground water (A layer)
c. Illuviation - the accumulation or addition of fine soil particles or mineral solutions resulting from percolation (B layer)

Soil range in color from the blacks, browns, grays, reds, yellows, and near whites. Color changes can usually be noted in examining a soil profile. The surface of A layer, for example, is usually darker than the subsoil since it contains more organic matter.

Soil texture refers to the size of the particles. The terms gravel, sand, silt and clay actually refer to size and not composition. Gravel is quite large but the adjoining diagram gives you some idea of the relative size of the other three.



7. Nine different soil types will be considered. For each type we will be interested in:

a. The location on the earth's surface.
b. The relationship to other elements of the natural environment.
c. The profile characteristic.
d. The agricultural worth of the soil.

8. Podzol Soils

Location:

Relationships:

Profile Characteristics:

Agricultural Worth:

9. Podzolic Soils

Location:

Relationships:

Profile Characteristics:

Agricultural Worth:

10. Latosolic Soils

Location: ____

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Relationships: ____

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Profile Characteristics: ____

Agricultural Worth: ____

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11. Podzolic - Latosolic Soils

Location: ____

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____

Relationships: ____

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Profile Characteristics: ____

Agricultural Worth: ____

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12. Chernozemic Soils

Location:

Relationships:

Profile Characteristics:

Agricultural Worth:

13. Desertic Soils

Location:

Relationships:

Profile Characteristics:

Agricultural Worth:

14. Chernozemic - Desertic Soils

Location:

Relationships:

Profile Characteristics:

Agricultural Worth:

15. Tundra Soils

Location:

Relationships:

Profile Characteristics:

Agricultural Worth:

16. Alluvial Soils

Location:

Relationships:

Profile Characteristics:

Agricultural Worth:

17. Now compare the various soil regions to the regions of dense population. What do you find?

18. Statements you can make about the distribution of soil throughout the world?

WHAT IS SOIL[1]

Soil is the outer portion of the earth's crust that supports the growth of plants. About half its total volume is made up of partially decomposed rock material (mineral matter) mixed with remains of plants and animal life (organic matter). The remaining volume is made up of the pore spaces or openings of varying sizes that occur between the soil particles. These spaces are filled with either water or air. When a soil is in good condition for plant growth air will occupy about half the pore space and water the other half. In addition, the soil contains a large population of microorganisms (bacteria) together with insects and smaller animal life.

Soil Profiles

Soils are composed of one or more layers of horizons lying approximately parallel to the earth's surface. The different horizons develop from the interaction of five soil-forming factors. A vertical section through the horizons is called a soil profile.

Most soils have three principal horizons, which are designated by capital letters: The surface or A horizon, the subsoil or B horizon, and the parent material underlying the subsoil, or the C horizon. Differences within each horizon may be indicated by numbers written as subscripts after the letters. For example, the A horizon might be subdivided into a surface (A_1) and a subsurface (A_2) horizon.

To know the physical characteristics of any soil, we must study its profile, usually to a depth of 3 or 4 feet. Two soils which look alike on the surface may show important differences in the horizons below the surface. These differences, which we can discover by sight and touch, may mean that the soils should be managed in entirely different ways.

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1. Walker, Ernest D. Understanding Soils, by Ernest D. Walker and W. F. Purnell. Urbana, University of Illinois, College of Agriculture. Cooperative Extension Service, Circular 758.

FACTORS IN SOIL FORMATION[1]

The five major factors in soil formation are climate, living organisms, parent rock, topography and time. They control the weathering of rocks and the gains, losses, and alterations throughout the regolith, including the soil profile.

Temperature and rainfall govern rates of weathering of rocks and decomposition of minerals. They also influence leaching, eluviation, and illuviation. Thus climate functions directly in the accumulation of soil parent materials and in differentiation of horizons. The indirect effects of climate are through its control over the kinds of plants and animals that can thrive in a region. These living organisms, in turn, are of major importance in differentiating horizons in soils.

Because climate is so important to soil formation, the broad soil regions of the world tend to follow the distribution of climates. Soil and climatic regions are not identical, however, because five factors rather than one are important in soil formation.

Living organisms--plants, animals, insects, bacteria, fungi, and the like--are important chiefly to horizon differentiation and less so to the accumulation of soil parent materials. Gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity are among the shifts due to living organisms. Plants and animals may also mix horizons and thus retard their differentiation.

Plants largely determine the kinds and amounts of organiz matter that go into a soil under natural conditions. They also govern the way in which it will be added, whether as leaves and twigs on the surface or as fibrous roots within the profile.

Some plants take their nitrogen from the air and add it to the soil as they die. Deep-rooted plants reverse leaching processes in part. The roots may take up calcium, potassium, phosphorus, and other nutrient elements from the C horizon or even from the deeper regolith, only to leave some part of those nutrients in the solum when the plants die.

The effects of plants on the soil beneath them may be striking. Desert shrubs, such as shadscale, for example, concentrate sodium in the soil on which they grow. Enough sodium is taken up by the plant and added to the surface of the soil to make it far more alkaline than the soil between the bushes. Most effects are less dramatic than this, but all are important to horizon differentiation.

Horizons may be mixed by plants or animals. When trees tip over in a forest, the roots take up soil materials from several horizons. As the upturned roots decay, this soil material tumbles back down, mixing as it goes. Burrowing animals also mix horizons as they build their homes. Such mixing partly offsets horizon differentiation.

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[1] U. S. Department of Agriculture, 1957 Yearbook of Agriculture--Soil. Washington, D. C., U. S. Government Printing Office, 1957.

Bacteria and fungi live mainly on plant and animal residues. They break down complex compounds into simpler forms, as in the decay of organic matter. It has been suggested that the humus in soils is largely dead bodies of micro-organisms; much of it seems to have about the same composition, even though it exists under widely different types of vegetation. Some micro-organisms fix nitrogen from the atmosphere and thus add it to the regolith in their bodies when they die.

Parent rock is sometimes called a passive factor in soil formation. It must be weathered to form soil parent materials, which are further changed as horizons develop in a soil profile.

The character of the rock itself is a factor in the kinds of changes and how fast they go. Pure quartzite will disintegrate, for example, but little else can happen to it. Quartzite consists of quartz grains cemented together by silica. Quartz is also silica, a combination of silicon and oxygen. Highly resistant to weathering, quartz grains are well-nigh permanent. Small ones may dissolve very slowly, but no plant nutrients are released and no clay is formed as they do.

Most rocks are mixtures of many minerals, few of which are able to withstand weathering as well as quartz. The composition and structure of rocks strongly influence the rate of weathering and the products of that weathering. These in turn are both important to the kind of soil that may be formed.

Topography, or the lay of the land, affects runoff and drainage. Other things being equal, runoff is large on steep slopes and small on level ones. Drainage is rapid from mountainsides and slow from level plains. The amount of water that moves through the soil depends partly on topography. More water runs off and less enters the soil on steep slopes, as a rule, than it does on gentle slopes. The runoff also removes more of the weathered rock on steeper slopes, other things being the same.

Soil profiles on steep slopes generally have indistinct horizons and are shallower than those on gentle slopes. Low and flat topography often means that extra water is added to the soil. The extra water is reflected in gray or mottled colors or in higher amounts of organic matter in the A horizon. If water stands on the surface, peat deposits may be formed. Topography thus influences the moisture regime in soil and the erosion from its surface.

Time is required for soil formation--how much time depends on where the processes must start.

A tremendous interval is needed for development of soil from freshly exposed and fairly pure limestone. The limestone dissolves slowly while the rains come and go. As the mass of the limestone dissolves and is carried away, any impurities originally present are left to form a regolith. Million of years may pass before parent materials have accumulated and horizons have been formed under such circumstances.

Much more time is needed, generally speaking, for the accumulation of soil parent materials than for the differentiation of horizons in the profile. This would be of the first importance if soil formation had to start from scratch. Because of weathering during past geologic times, however, a regolith now exists widely over the continents. In fact, soils have been formed on most land surfaces, perhaps many times, since molten lava first crystallized into rock about a billion years ago.

SUMMARY

A considerable amount of time has been devoted to the study of man's physical environment. Hopefully, old understandings have been strengthened and new understandings have been added.

What can you say at this time in the way of summarizing statements about the physical environment and the relationship of man to his physical environment? For each statement include proof from the material we have just studied.

Here, for student use, was a map on LANDFORMS. We recommend using a World Outline Map (i. e., Goodes Interrupted Homolosine Projection--with modification) and global distribution of mountains, hills and plains found in:

Van Riper, Joseph E. Man's Physical World (New York: McGraw-Hill Book Company, 1962), fig. 4. 8, pp. 100-101.

Here, for student use, was a map on CLIMATES. We recommend using a World Outline Map (i. e., Goodes Interrupted Homolosine Projection--with modification) and global distribution of tropical savanna, tropical rainforest, dry, humid continental, subarctic, polar, marine west coast, humid subtropical, and Mediterranean climates (i. e., a modified and simplified version of Köppen formula for climate classification).

Here, for student use, was a diagram of "Major Climatic Types Arranged on a Hypothetical Continent." We recommend its use--found in:

Finch, *et al.* *Elements of Geography* 4th Ed. (New York. McGraw-Hill Book Company, 1957), Fig. A.2, p. 125.

Here, for student use, was a map on VEGETATION. We recommend using a World Outline Map (i. e., Goodes Interrupted Homolosine Projection--with modification) and global distribution of tropical grasslands, coniferous forest, mixed broadleaf and coniferous forest, heavy tropical rainforest, lighter tropical forest, Mediterranean shrub and woods, mid latitude grassland, desert shrub and waste, and tundra, as found in:

Finch, *et al.* *Elements of Geography* 4th Ed. (New York: McGraw-Hill Book Company, 1957), plate 5.

Here, for student use, was a map on SOILS. We recommend using a World Outline Map (i. e., Goodes Interrupted Homolosine Projection--with modification) and global distribution of podzol, podzolic, podzolic-latosolic, latosolic, chernozemic, chernozemic-desertic, desertic, alluvial, and tundra soils, as found in:

Finch, et al. Elements of Geography 4th Ed. (New York: McGraw-Hill Book Company, 1957), plate 6.

Here, for student use, was a map on 1960 WORLD POPULATION DISTRIBUTION. We recommend using a World Outline Map (i.e., Goodes Interrupted Homolosine Projection--with modification) and a current global distribution of world population depicting 60 people/square mile.